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ABSTRACT

This publication is a collection of 45 integrated project plans developed by teams of secondary academic and career and technology teachers, school administrators, industry partners, and postsecondary educators over 3 different meetings in 1997. The projects all center on linking at least one academic discipline (English, mathematics, science, and social studies) and one of three career clusters (manufacturing, engineering technology; health and biosciences; and environmental, agricultural, and natural resources). They integrate the High School Core Learning Goals in English, mathematics, science, and social studies, Skills for Success, and industry skill standards. The projects are also designed to: (1) increase the academic achievement and technical skills of students; (2) provide challenging assignments and activities that interest and motivate students to use high-level academic and technical skills; and (3) provide curriculum that supports the career cluster framework by linking academic content to career interests and real-world applications. Each project plan consists of: academic discipline and career cluster; activities list; academic and industry skill standards addressed; resources and materials; expectations of students, including final product; roles of participating teachers; linkages to industry; timeline; and assessment strategies. A sample of project titles are Wellness Assessment; Students Problem Solve Legal, Ethical, Medical, Personal, and Social Issues; Effective Bacterial Screening Procedures; Modular House Design Team Project; and Designing a Sports Drink for a New Era. (YLB)

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ED 439 229

MARYLAND

CAREER CONNECTIONS

World Class Education That Works

1997 Integrated Project Reports

A collection of integrated projects designed by Maryland educators and business partners

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Career Connections
Work Session on Blended Instruction

Integrated Project Reports

The following is a collection of 45 integrated project plans developed by teams of secondary academic and career and technology education teachers, school administrators, industry partners, postsecondary educators and others. These projects were developed during three separate one-day Work Sessions on Blended Instruction: March 7, 1997, May 19, 1997, and November 5, 1997.

The projects are designed to:

- increase the academic achievement and technical skills of students;
- integrate the High School Core Learning Goals in English, mathematics, science and social studies, Skills for Success and industry skill standards into curriculum to prepare students for success in further education and careers;
- provide challenging assignments and activities that interest and motivate students to use higher-level academic and technical skills; and
- provide curriculum that supports the career cluster framework by linking academic content to career interests and real-world applications.

Each Core Learning Goal and Expectation is noted in the following way: Academic area or Skill for Success is listed first in abbreviated form. The following number represents the goal number. The last number indicates the expectation which is written beside it. For example, Eng. 2.1 is English Goal 2, Expectation 1. The Core Learning Goals are listed on the following page.

While the projects integrate many subject areas, they all center on linking at least one academic discipline (English, mathematics, science and social studies) and one of the nine career clusters identified as critical to Maryland's economic development. The three career clusters included in these projects are:

- Manufacturing, Engineering Technology;
- Health and Biosciences; and
- Environmental, Agricultural and Natural Resources.

Teachers are encouraged to use these project plans as they are or to expand or adapt them to fit their curriculum needs.

As you implement these and other projects, please let us know how well they worked and where they need improvement. Please send comments, suggestions and sample products to Pat Mikos at MSDE, 200 West Baltimore Street, Baltimore, MD 21201. Fax comments to (410) 333-2099 or call (410) 767-0635.

Key for Maryland's High School Core Learning Goals

English Goals:

1. *The student will demonstrate the ability to respond to a text by employing personal experiences and critical analysis.*
2. *The student will demonstrate the ability to compose in a variety of modes by developing content, employing specific forms, and selecting language appropriate for a particular audience and purpose.*
3. *The student will demonstrate the ability to control language by applying the conventions of standard English in writing and speaking.*
4. *The student will demonstrate the ability to evaluate the content, organization, and language use of texts.*

Mathematics Goals:

1. **FUNCTIONS & ALGEBRA**--*The student will demonstrate the ability to investigate, interpret & communicate solutions to mathematical and real-world problems using patterns, functions, and algebra.*
2. **GEOMETRY, MEASUREMENT & REASONING**--*The student will demonstrate the ability to solve mathematical and real-world problems using measurement and geometric models and will justify solutions and explain processes used.*
3. **DATA ANALYSIS & PROBABILITY**--*The student will demonstrate the ability to apply probability and statistical methods for representing & interpreting data & communicating results, using technology when needed.*

Science Goals:

1. **SKILLS & PROCESSES**--*The student will demonstrate ways of thinking and acting inherent in the practice of science. The student will use the language and instruments of science to collect, organize, interpret, calculate, and communicate information.*
2. **CONCEPTS OF EARTH/SPACE SCIENCE**--*The student will demonstrate the ability to use scientific skills & processes (Core Learning Goal 1) to explain the physical behavior of the environment, earth & universe.*
3. **CONCEPTS OF BIOLOGY**--*The student will demonstrate the ability to use scientific skills and processes (Core Learning Goal 1) and major biological concepts to explain the uniqueness and interdependence of living organisms, their interactions with the environment, and the continuation of life on earth.*
4. **CONCEPTS OF CHEMISTRY**--*The student will demonstrate the ability to use scientific skills and processes (Core Learning Goal 1) to explain composition and interactions of matter in the world in which we live.*
5. **CONCEPTS OF PHYSICS**--*The student will demonstrate the ability to use scientific skills & processes (Core Learning Goal 1) to explain & predict the outcome of certain interactions which occur between matter & energy.*

Social Studies Goals:

1. **POLITICAL SYSTEMS**--*The student will demonstrate an understanding of the historical development and current status of principles, institutions, and processes of political systems.*
2. **PEOPLES OF THE NATION & WORLD**--*The student will demonstrate an understanding of the history, diversity, and commonality of the peoples of the nation and world, the reality of human interdependence, and the need for global cooperation, through a perspective that is both historical and multicultural.*
3. **GEOGRAPHY**--*The student will demonstrate an understanding of geographic concepts and processes to examine the role of culture, technology, and the environment in the location and distribution of human activities throughout history.*
4. **ECONOMICS**--*The student will demonstrate an understanding of the historical development & current status of economic principles, institutions, and processes needed to be effective citizens, consumers & workers.*

Skills for Success Goals:

1. **LEARNING SKILLS**--*The student will plan, monitor, and evaluate his or her own learning experiences.*
2. **THINKING SKILLS**--*The student will think creatively, critically, and strategically to achieve goals, make effective decisions, and solve problems.*
3. **COMMUNICATION SKILLS**--*The student will plan, participate in, monitor, and evaluate communication experiences in a variety of situations.*
4. **TECHNOLOGY SKILLS**--*The student will understand, use, and evaluate technologies for a variety of purposes and situations.*
5. **INTERPERSONAL SKILLS**--*The student will work effectively with others and participate responsibly in a variety of situations.*

Mathematics/Health-Bioscience

Title: ***Wellness Assessment***

Activities: As a part of this project, students will:

1. Keep a food intake and physical activity journal for one week including the following calculations: the percent of fat in daily food intake, the proportion of calories to fat calories, and the number of calories burned from physical activities;

2. Invite health career persons to conduct instruction on vital signs, T.P.R, blood pressure and other health measures;

3. Measure and record their height, weight, temperature, pulse, respiration, and blood pressure (as part of the exercise students will convert Celsius to Fahrenheit and develop linear equations); and

4. Visit a fitness center for consultation with a fitness expert to collect baseline fitness data based on exercise done at the fitness center, compare/contrast individual and class data with age and weight standards for their age group, calculate the mean, median, mode for the above data.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 5.1 The student will demonstrate effective interaction strategies in groups.

- **Industry Skill Standards: Health-Bioscience**
  Therapeutic Diagnostic Core: Therapeutic and diagnostic workers will understand the process for monitoring client health status. They will assess health status according to respective professional standards and report results to the treatment team.

Resources and materials to be used

- Text--journals, health information, food pyramid, calorie tables and reference materials
- Health professionals, fitness center expert, and wellness clinic professional
- Graphing calculators, computers, sphygmomanometer, and scale thermometers

Expectations of students (including final product) As a part of this project, students will:

- Understand their wellness level based on fitness and nutrition;
- Collect and interpret personal and group data; and
- Report analysis of data orally and in writing.

Roles of participating teachers:

- **Physical Education** teachers will assist students in completing fitness measures.
- **Family and Consumer Science** teachers will cover concepts in nutrition and health.
- **Mathematics** teachers will assist students in collecting and analyzing data and producing charts and graphs for presenting information.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will learn about the role of health care professionals in a variety of settings and professions--fitness centers, outpatient wellness clinics, dietician and nutritionist. Students will participate in one or two-day shadow experiences in a hospital and/or fitness center.

Timeline: Minimum of two weeks during beginning 1/3 of course.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their abilities to gather and calculate fitness measures, and to compose oral and written presentations. As a test, students will determine the wellness status based on the criteria above for a fictional person.

English/Health-Bioscience

Title: ***Safety Standards for a Chemical Plant***

Activities: As a part of this project, students will:

1. Visit a chemical plant to observe safety protocols that incorporate biology and chemistry;

2. Work in groups to research existing protocols and to write safety protocols that are based on scientific principles and are easy to understand by visitors and workers in the chemical plant;

3. Examine the historical development of safety regulations and protocols for several industries (each group may be assigned to research one industry) and compare them across work settings; and

4. Report, by team, on the development of and scientific basis for safety protocols for the industry/work setting researched by the group.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.2 The student will compose texts using the pre-writing, drafting, and revision strategies of effective writers and speakers.
  - Eng. 4.2 The student will assess the effectiveness of choice of details, organizational pattern, word choice, syntax, use of figurative language, and rhetorical devices in the student's own composing.
  - Sci. 4.5 The student will investigate the impact of Chemistry on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.3 The student will demonstrate strategic thinking to make effective decisions, solve problems, and achieve goals in a variety of situations.
  - SFS 3.1 The student will plan for successful communication experiences.

- **Industry Skill Standards: Health-Bioscience**
  Apply Workplace Safety Practices: The worker will demonstrate an understanding of health, safety, and legal requirements with regard to processes, products, and people, with attention to 1) health and safety requirements and procedures, including those established by local, state and federal regulations; 2) potential health and safety hazards; 3) confidentiality of proprietary information; and 4) company-established safety practices.

Resources and materials to be used

- Text--science text and journal articles concerning health and safety and safety manuals
- Computers for research (Internet) and development of a final report/presentation materials
- Funding for field trips and participation of a safety/training director at the plant

Expectations of students (including final product) As a part of this project, students will:

- Create a brochure, paper or website page which outlines safety standards for a chemical plant and/or other health/biosciences setting;
- Convey career information--specifying the level of training required by those working in different areas of a chemical plant--in their final report; and
- Demonstrate communication skills, interpersonal skills, thinking skills, technology skills, and learning skills through their research, analysis of data and final report.

Role of participating teachers:

- **Computer Science** teachers will assist students in accessing information and developing report materials for their final presentation.
- **English** teachers will assist students in the research and reporting process.
- **Science** teachers will cover scientific principles and provide leadership for the entire project.
- **Allied Health** teachers will provide information concerning a variety of careers in science and health and will arrange for student visits to a chemical plant.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will see first-hand, the academic and technical skills at work in a chemical plant. Industry representatives will speak to students about expectations for employment within the industry.

Timeline: Semester-long project; however, many other activities and content topics will be discussed and completed depending on curricular requirements in English, Science, and Computer Science.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed through peer-and self-evaluation, and by an industry representative and each teacher based on standards of the curricular area.

Social Studies/Health-Bioscience

Title: ***The Interdependence of Living Organism--A Cell Line from a Human Source (Hair)***

Activities: As a part of this project, students will:

1. Learn about experimental design and principles of the scientific research process;
2. Review laboratory procedures and concepts from biology;
3. Visit a working laboratory--medical, research or industry--to learn about a variety of experimental procedures and applications;
4. Develop an experiment using cell (bacteria) cultures; and
5. Prepare a laboratory report in which experimental data is gathered and analyzed.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Sci. 1.1 The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.
  - Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  - Sci. 3.1 The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Health-Bioscience**
  Technical Skills (D): Basic Microbiology: Identify and quantify microorganisms and cells. Isolate, maintain and store pure cultures. Maintain and analyze fermentation materials. This also includes harvesting cells, transforming hosts, and performing bioassays.

Resources and materials to be used

- Text--biology text and articles on famous experiments in history
- Laboratory equipment--petri dishes, cultures, pipettes, and transfer case
- Access to a working laboratory--medical, research or industry
- Computers for Internet access for research and background information

Expectations of students (including final product) As a part of this project, students will:

- Use the scientific method to conduct an experiment;
- Gather and analyze data--including observations and predictions;
- Demonstrate appropriate and safe lab performance and techniques;
- Use computation skills and communication skills to produce a laboratory report; and
- Demonstrate analysis and evaluation skills by applying what is learned to other applications in the medical field, a research setting or an industry setting.

Role of participating teachers:

- **Health** and **Biology** teachers will facilitate student learning of scientific concepts and laboratory procedures.

- **Allied Health/Family and Consumer Sciences** teacher will arrange for student visits to a working laboratory and/or presentations by science and health care professionals.

Linkages to industry(work-based learning opportunities or roles of industry representatives): Health care professionals will describe applications of scientific concepts and the experimental research design in various settings. Students will visit a laboratory, hospital, food processing plant or other industry setting to view the use of scientific concepts in work.

Timeline: The project will take approximately two weeks to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their ability to conduct an experiment, collect and analyze data, present information and apply research to work settings.

Social Studies/Health-Bioscience

Title: ***Providing Health Care to Diverse Clients***

Activities: As a part of this project, students will:

1. Examine issues that may be encountered by a hospital as it attempts to attract more diverse patients. For example: dietary needs for patients from different cultures, language barriers between immigrants/foreign patients and hospital staff, and other issues;

2. Review state/local health department standards and their implications on health care for patients from a variety of cultures and religious backgrounds;

3. Visit a large metropolitan hospital where these issues are most likely to be faced;

4. Work in teams to identify barriers to health care and develop a strategy for better providing health care for different populations; and

5. Develop a brochure or report outlining their strategy for addressing a particular health care need (e.g., pamphlets concerning immunization services in Spanish).

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - USH.2.1 The student will examine how interactions among individuals and groups from various ethnic, racial, and religious backgrounds influenced the development of the United States.
  - WH.3.2 The student will examine the role of culture in shaping regional and global interactions.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 5.2 The student will work cooperatively with others in a variety of group situations.

- **Industry Skill Standards: Health-Bioscience**
  Health Care Core--Ethics: Health care workers will understand accepted ethical practices with respect to cultural, social, and ethnic differences within the health care environment. They will perform their duties within established ethical guidelines, supporting sensitive and quality health care delivery.

Resources and materials to be used

- Text--articles on health issues for different populations--ethnic, religious, age, race
- Computer access for research and development of final product (pamphlet or report)
- Industry consultants--contact person at JHU Medical Center, dietician, human relations expert, and hospital administration representative

Expectations of students (including final product) As a part of this project, students will:

- Work in teams to develop human relations and communication skills;
- Develop research and problem solving skills; and
- Produce a product--paper or pamphlet--to apply concepts to field of study.

Role of participating teachers:

- **Allied Health** teachers will direct the project, assist students in researching health care issues for different groups and coordinate student visits to the hospital.

- **Social Studies** teachers will cover health issues as they relate to different demographic groups and cultural barriers in the current health care delivery system.

- **English** teachers will assist students in producing information/reports to be used by community members.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will learn about issues in public health and participate in job shadowing and internships at JHU. The products of student research may be used to enhance health care access for different groups in the community.

Timeline: The project will take at least one month to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their ability to identify issues, design problem solving methods, and work in teams through peer review, self-assessment and teacher assessment.

English/Manufacturing

Title: ***Developing a Business Plan to Produce an Item that Recycles Materials***

Activities: As a part of this project, students will:

1. Learn about the recycling process and what materials can be recycled and at what cost;
2. Develop a business plan to produce an item that recycles materials (i.e., t-shirts, sweaters, soda cans) that includes what product will be made, who will buy it, and what will it cost;
3. Draw diagrams and charts to illustrate the calculations used to project their success;
4. Develop marketing materials--video, print, radio--to promote their product; and
5. Be given a limited spending amount to select and "purchase" products over a three week period (shopping day is one day per week) and determine which group/product is most successful.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Sci. 4.6 The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Manufacturing**
  Communicate Information to Others: The worker will apply business and computer skills by developing a business plan, keeping records, designing and completing forms, giving oral reports, writing technical and non-technical reports, and maintaining positive customer relations.

Resources and materials to be used

- Computer access to Internet (use actual "Day Timer" page to use as log) and to develop promotional materials
- Text--scientific principles of recycling, mathematical calculations for costs

Expectations of students (including final product) As a result of this project, students will:

- Work in groups and rotate roles with in the "company" to learn about all aspects of a task;
- Describe project (visually and verbally) in a presentation to potential customers; and
- Write individual reports on the process, production plan and sales results.

Role of participating teachers:

- **English** teachers will direct students in completing marketing materials and a final report.
- **Business** teachers will cover principles in marketing and research and business accounting.
- **Science** teachers will cover information on recycling materials and costs.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will learn about environmental science issues and recycling from guest speakers--government agency/environmental scientists. Students will also visit a manufacturing plant to learn about production.

Timeline: The project will take two weeks or 10 class periods to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their ability to work in teams, oral and written communication skills, problem solving skills and understanding of manufacturing and business concepts and the environmental impact of recycling.

English/Manufacturing

Title: ***Being the Best--Manufacturing Standards of Certification for Quality (ISO 9000)***

Activities: As a part of this project, students will form teams or "companies" and will:

1. Learn about industry standards and read the International Organization for Standardization--ISO 9000 standards as they relate to each "company";

2. Write a job description (using flow chart of manufacturing process for content), design and complete model forms, and prepare flow chart for certification processes for their company;

3. Assess where another student group/company is regarding standards and prepare a report for the other company on how to meet ISO 9000 standards;

4. Prepare and present an oral report for ISO 9000 certification team on how each company will improve performance due to ISO standards; and

5. Receive certification--based on meeting ISO standards--and prepare a press release.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Eng. 4.2 The student will assess the effectiveness of choice of details, organizational pattern, word choice, syntax, use of figurative language, and rhetorical devices in the student's own composing.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.1 The student will understand and evaluate the uses of current technologies for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Communicate Information to Others: The worker will apply business and computer skills by developing a business plan, keeping records, designing and completing forms, giving oral reports, writing technical and non-technical reports, and maintaining positive customer relations.

Resources and materials to be used

- ISO certified company information--each team of students represent a different company
- Representatives from ISO certified business
- Computer access for research of company standards and products and for production of report materials (forms, charts, graphs and written text)

Expectations of students (including final product) As a result of this project, students will:

- Demonstrate the ability to compose in a variety of modes by developing content, employing specific forms, and selecting language appropriate for a particular audience--leading to ISO certification;
- Apply business and computer skills by developing a business plan, keeping records, designing and completing forms, giving oral reports, and writing technical and no technical reports--leading to ISO certification; and
- Think creatively, critically, and strategically to achieve goals, make effective decisions and solve problems--leading to ISO certification.

Role of participating teachers:

- **Business/Manufacturing** teachers will explain roles of students, plan/conduct a field trip to company or business partner, contact industry representatives for certification documents and data to complete documents, and recruit mock certification board of representatives.

- **English** teachers will determine levels of language for diversified audiences, clarify ideas for organization and reporting procedures and prepare students for oral presentations.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will learn about industry standards through field trips, guest speakers and written text.

Timeline: The project will take two weeks to one month to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their understanding and use of ISO documentation, use of data and oral and written reporting skills.

Science/Manufacturing

Title: ***Remotely Operated Pneumatic Probe***

Activities: As a part of this project, students will:

1. Review principles of mechanics, electricity, magnetism and thermodynamics;

2. Visit an industry setting or work site to observe the use of robotics;

3. Construct a remotely operated Pneumatic probe and demonstrate its use in a work setting; and

4. Present to the class and visiting industry representatives the scientific principles involved in the construction and use of the pneumatic probe and offer examples of its use in industry.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  - Sci. 5.2 The student will know and apply the laws of electricity and magnetism and explain their significant role in nature and technology.
  - Sci. 5.3 The student will recognize and relate the laws of thermodynamics to practical applications.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used

- Text--science and mathematics curriculum materials
- Human resources--local industry representatives and work site
- Computers and software for research and production of presentation/report materials
- Low cost raw materials for construction of pneumatic probe

Expectations of students (including final product) The students will demonstrate the ability to use scientific skills and processes through the design and construction of a remotely operated pneumatic probe.

Role of participating teachers:

- **Science** teachers will cover theories and principles of mechanics, electricity and magnetism.
- **Mathematics** teachers will assist students in calculating a cost analysis, designing linear programming and producing charts and graphs.
- **Technology Education** teachers will assist students with industry applications, laboratory construction, and use of tools and machinery.
- **English** teachers will assist students with written presentations and supporting materials.
- **Art** teachers will assist students in producing two-and three-dimensional models.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Industry representatives will serve as technical advisors and consultants for teachers and students. They will also provide site visits for students a businesses.

Timeline: The project will take at least two weeks to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on cognitive (objective to assess knowledge), formative (intermediate feedback) and presentation skills. Each student will explain the incorporation of scientific principles and groups will demonstrate their robotic arm. Students, teachers, and industry representatives will evaluate and critique projects.

Science/Manufacturing

Title: ***The Best Box Contest--Determining the Optimal Design of Corrugation***

Activities: As a part of this project, students will:

1. Test the strength and durability of several examples of different corrugation designs;
2. Collect, record and analyze data from different types of corrugation;
3. Visit a shipping and receiving department in a manufacturing setting to learn about the importance of constructing safe and efficient shipping materials;
4. Investigate and test alternative shapes/design for corrugation;
5. Work in teams to determine the best design, size and shape for shipping a variety of objects --glass vase, bowling ball, or single raw egg; and
6. Construct the shipping box and report to the class why they chose and constructed the box.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  - Sci. 5.1 The student will know and apply the laws of mechanics to explain the behavior of the physical world.
  - Math 2.2 The student will apply geometric properties and relationships to solve problems using tools and technology when appropriate.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.1 The student will generate and evaluate creative ideas in a variety of situations.
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Manufacturing –**
  Control Quality of the Manufacturing Process and Product: The worker will select, set up, and perform diagnostic tests, including analysis and interpretation of test data and problems that require corrective actions.

Resources and materials to be used

- Text-science and mathematics
- Materials--paper, cardboard, glue, measuring devices, stress tester, crush tester
- Computer access for developing final report and presentation materials
- Industry representatives to provide information and site visits for students

Expectations of students (including final product) As a result of this project, students will:

- Identify and understand laws of physics that determine the most efficient corrugated design-materials strength, pressure etc.;
- Calculate and compare measurements for a variety of box designs and sizes; and
- Complete written and oral presentation of research and design activities including justification of design and uses in industry.

Role of participating teachers:

- **Manufacturing/Business** teachers will provide information on the role of packaging, shipping and receiving in a variety of industry settings.

- **Science** teachers will cover concepts in physics as they relate to the project and will assist students in the construction of boxes.

- **Mathematics** teachers will assist students in calculations and producing charts and graphs to illustrate why they chose a particular design for their project.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will connect what they are learning in school to the world of work through on-site observations of the manufacturing process, testing corrugated designs at manufacturing facility and constructing boxes for shipping materials.

Timeline: The project will take two weeks to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their ability to conduct research, to write a lab report and final presentation, to conduct an oral presentation and to incorporate what they have learned in the design and construction of a box.

Mathematics/Health-Biosciences

Title: ***Healthy Hearts vs. Unhealthy Hearts***

Activities: As a part of this project, students will:

1. Learn about cardiac measures--such as pulse rate and heart rate--and what they indicate in terms of health;

2. Participate in an experiment to determine the effect of exercise on the heart (students will be organized into three groups--no exercise, small amount of exercise, and aerobic exercise);

3. Predict the pulse/heart rates for each experimental group and chart their predictions;

4. Do the prescribed activity for each group, for two weeks during the last 5-10 minutes of class, and measure/chart their pulse/heart rates;

5. Collect similar data from a sample of teachers/volunteers and chart their data; and

6. Write an evaluation of their analysis of the graphs, the factors that may have affected the results, and their predictions (this could take the form of a journal or a paper at the end of the project).

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  - Sci. 3.1 The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Health-Bioscience**
  Therapeutic Diagnostic Core: Therapeutic and diagnostic workers will understand the process for monitoring client health status. They will assess health status according to respective professional standards and report results to the treatment team.

Resources and materials to be used

- Text--biology and mathematics, articles on cardiac fitness, print outs from heart monitors of healthy and unhealthy hearts
- Human resources--health care providers to share how cardiac measures are used
- Equipment--heart monitor (or T180 is available), computers for research and reports and constructing graphs and comparison charts

Expectations of students (including final product) As a result of this project, students will:

- Collect and analyze health data across several samples;
- Predict outcomes and compare with actual outcomes for several groups;
- Produce charts and graphs and a written analysis on the data gathered; and
- Connect what they have learned about cardiac health to applications in the real world.

Role of participating teachers:

- **Allied Health** and **Biology** teachers will cover concepts from biology and health as they relate to cardiac health and monitoring the heart.

- **Mathematics** teachers will assist students in understanding basic statistical sampling and data comparisons, graphing data and calculating rates.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will connect what they are learning in school to the world of work through presentations by health care professionals and representatives from other businesses that have wellness centers.

Timeline: The project will take two weeks to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their ability to conduct research, monitor heart rate/pulse and produce graphs and written reports. Charts and graphs will be graded for accuracy and students will submit their journal (lab notes) and/or a final paper.

English/Health-Bioscience

Title: ***Students Problem Solve Legal, Ethical, Medical, Personal and Social Issues***

Activities: As a part of this project, students will:

1. Use effective problem solving skills concerning the legal, ethical, medical, personal and social issues related to specific health/bioscience scenarios;

2. Brainstorm hypothetical situations involving ethics (group discussion and reporting);

3. Learn about regulatory guidelines, safety issues and effects of radioactivity as an example of potential safety/health risk posed to workers and society (guest speaker from OSHA);

4. Participate in field trips to a chemical or hospital laboratory to observe safety regulations; and

5. Investigate and report on one ethical dilemma chosen by the student.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.1 The student will use effective strategies before, during, and after reading, viewing, and listening to self-selected and assigned materials.
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Sci. 4.5 The student will investigate the impact of Chemistry on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 1.3 The student will apply acquired knowledge, skills and strategies effectively in new learning situations.

- **Industry Skill Standards: Health-Bioscience**
  Health care workers will understand the legal responsibilities, limitations, and the implications of their actions within the health care delivery setting. They will perform duties according to regulations, policies, laws, and legislated rights of clients.

Resources and materials to be used

- Text--classic and contemporary literature, newspaper and journal articles
- Films and audio-visual aids
- Human resources--guest lecturers from industry and student visit to laboratory
- Computer access-Internet research and production of reports

Expectations of students (including final product) As a result of this project, students will:

- Demonstrate problem solving skills in resolving health related ethical challenges;
- Demonstrate safety skills while at an industry site;
- Accurately report and document observations; and
- Keep a journal of observations, analysis of case studies, site visits, and response to films.

Roles of participating teachers:

- **English** teachers will supply works from difference genres--poetry, short stories, and newspapers to introduce students to ethical situations in the health care industry.

- **Allied Health** teachers will address ethical and legal issues and introduce terminology and OSHA regulations.

- **Bioscience** teachers will cover environmental issues and safety in the lab.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will participate in visits to industry laboratories and will learn about ethical dilemmas as they are faced by health care providers.

Timeline: The project will take two weeks (90 minute periods) to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on their journal notes, reflection reports (indicating the change in their thinking from the beginning of the unit to the end) and a persuasive speech on a current ethical situation using some audio-visual material.

Science/Health-Bioscience

Title: ***The Hot Zone***

Activities: As part of this project, students will:

1. Utilize lab skills in bacterial cell cultures. Groups of students in a bacterial cell lab (suggest culture of Staph. Aureus) will address variables of temperature, time, light sources;

2. Collect and analyze data and communicate results with other students and teachers through "ER' simulation game for debriefing;

3. Visit a working medical, research or industry laboratory to view safety procedures;

4. Relate what they are learning to health care practices that are designed to inhibit bacterial cell growth; and

5. Devise action plan for dealing with a potential contamination.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  - Sci. 3.1 The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Health-Bioscience**
  Technical Skills (D): Basic Microbiology: Identify and quantify microorganisms and cells. Isolate, maintain and store pure cultures. Maintain and analyze fermentation materials. This also includes harvesting cells, transforming hosts, and performing bioassays.

Resources and materials to be used

- Text--biology and health, OSHA guidelines, and Taber's Medical Dictionary
- Lab equipment (microscopes, petri dishes), bacterial culture, bleach
- Computers--access to Internet for research and production of reports
- Video camera and video tapes
- Health care professionals for guest speakers and laboratory visit

Expectations of students (including final product) As a result of this project, students will:

- Develop scientific research skills and learn about laboratory procedures;
- Relate lab experience and concepts in science to applications in health and industry;
- Devise action plan to resolve conflicts/potential contamination in a mock situation; and
- Develop a plan for a better hygiene regimen.

Roles of participating teachers:

- **English** teachers will assist students in research and writing a final report.
- **Mathematics** teachers will cover procedures for data analysis, graphs, and charts.
- **Biology/Science** teachers will instruct students in laboratory procedures and concepts in biology and chemistry as they relate to contaminants.
- **Biotech/Allied Health** teachers will cover concepts in science, OSHA guidelines and medical terminology.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will connect academic and technical skills through information from guest speakers from government (Center for Disease control) and industry (health care) and through job shadowing, internships and work study opportunities in industry.

Timeline: The project will take two weeks to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on (pre-test) daily health habits and bacterial culture growth variables and (post-test) on their plan for a better hygiene regimen and on their action plan to eliminate a potential contamination.

Social Studies/Health-Bioscience

Title: ***Health Care Scenarios Regarding Religious and Cultural Diversity***

Activities: As a part of this project, students will:

1. Address a religious or cultural diversity issue through research, role plays and interviews;

2. Review patient's profile and role play how to conduct an intake interview that reflects respect for patient's religious beliefs and culture;

3. Learn how cultural and religious beliefs impact health care practices; and

4. Develop a handbook for health care providers concerning religious and cultural differences as they relate to providing health care services.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.1 The student will use effective strategies before, during, and after reading, viewing, and listening to self-selected and assigned materials.
  - Eng. 2.2 The student will compose texts using the pre-writing, drafting, and revision strategies of effective writers and speakers.
  - USH.3.1 The student will demonstrate an understanding of the relationship of geographic factors on the development of culture and technology in the United States.
  - USH.2.1 The student will examine how interactions among individuals and groups from various ethnic, racial, and religious backgrounds influenced the development of the United States.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 2.3 The student will demonstrate strategic thinking to make effective decisions, solve problems, and achieve goals in a variety of situations.

- **Industry Skill Standards: Health-Bioscience**
  Health Care Core--Ethics: Health care workers will understand accepted ethical practices with respect to cultural, social, and ethnic differences within the health care environment. They will perform their duties within established ethical guidelines, supporting sensitive and quality health care delivery.

Resources and materials to be used

- Text--health care issues across different cultural, ethnic, religious groups, articles on alternative health care models used by different groups
- Human resources--health care providers to provide information on where, when and why certain issues are faced in providing health care to diverse groups
- Cultural representatives (ministers, family members, government representatives, etc.)

Expectations of students (including final product) As a result of this project, students will:

- Conduct a "cultural health fair";
- Observe intake interviews at a health care facility and conduct intake interviews--observed by health care worker;
- Develop a handbook for health care professionals concerning religious and cultural practices; and
- Make multi-media presentation on an individual culture's belief as they relate to health care

Roles of participating teachers:

- **Social Studies** teachers will set up the project, address law and ethics and other issues.
- **Foreign Language** teachers will present health concerns related to different cultures.
- **Allied Health** teachers will assist students in performing duties at a health care site and arrange for student observations.
- **Science** teachers will cover biology and health aspects of the project.

Linkages to industry (work-based learning opportunities or roles of industry representatives): Students will work with health care providers and will visit health centers to see projects in action.

Timeline: The project will take at least two weeks to complete.

Assessment strategies to determine students' mastery of specified standards: Students will be assessed on the handbook developed to help teach health care professionals how to address and understand ethical practices with respect to cultural, social and ethnic differences and on their oral and written communication skills.

Mathematics/Health-Bioscience

Title: ***Blood Pressure as a Critical Indicator of Health***

Activities: As a part of this project, students will:

1. Learn how to take blood pressure using cuff and CBL methods;
2. Collect and record data (bp and other health indicators) on clients from different demographic groups;
3. Represent data mathematically using tables, charts and graphs;
4. Analyze data in order to draw conclusions about health;
5. Apply technology and data analysis to real-life situations; and
6. Communicate results of data gathering and analysis.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 3.6 The student will investigate a biological issue and develop an action plan.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Health-Bioscience**
  Therapeutic Diagnostic Core: Therapeutic and diagnostic workers will understand the process for monitoring client health status. They will assess health status according to respective professional standards and report results to the treatment team.

Resources and materials to be used (including human resources)

- BP cuff, stethoscope and other diagnostic tools
- Graphing calculator and CBL
- Health care professionals to present on uses of diagnostic tools in a variety of settings

Expectations of Students (including final product)

Students will produce a written, oral, or video presentation representing and describing each of the activities listed above. Students will demonstrate the following skills: graphing; understanding and using ratios; functional relationships; percentage and range; problem-solving; reasoning; and use of medical technology.

Role of Participating Teachers:

- **Health** teachers will prepare students for taking and reporting blood pressure, collecting and representing data for different populations, analyzing health data, and applying skills and knowledge to a variety of health care settings.

- **Mathematics** teachers will have students collect, graph and chart data concerning health for different groups. Students will compare findings across patient groups.

Linkages to Industry:

Students will contact health care providers for assistance in finding subjects to include in the project. For example, students may visit a nursing home or community health center to view settings in which blood pressure information is gathered.

Timeline: The project will take approximately two weeks to complete.

Assessment strategies to determine student mastery of specified standards:

Health and mathematics teachers will develop a rubric for each activity and assess the final product (written, oral, or video) according to the rubric for each activity.

English/Health-Bioscience

Title: ***The Health of a Nation--Controlling a Virus***

Activities: As a part of this project, each student will:

1. Read *The Andromeda Strain* by Michael Crichton;
2. Be assigned a virus to research--Ebola, HIV, chicken pox, malaria;
3. Research how viruses are identified, isolated, contracted, spread and prevented;
4. Interview public health officials and health care providers about the virus under study;
5. Compare and contrast various accounts of infectious disease outbreaks--fictional, non-fictional, tabloid, newspaper, interviews, TV scripts and medical newsletters;
6. Investigate specific protocols for preventing the spread of disease; and
7. Develop a public health awareness campaign--newsletters, brochures and speeches.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.2 The student will construct, examine, and extend meaning of traditional and contemporary works recognized as having significant literary merit.
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Sci. 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Health-Bioscience**
  Health care workers will understand the legal responsibilities, limitations, and the implications of their actions within the health care delivery setting. They will perform duties according to regulations, policies, laws, and legislated rights of clients.

Resources and materials to be used (including human resources)

- Literature and/or films--*The Andromeda Strain, And the Band Played On, Outbreak, The Hot Zone The Diary of the Black Plague*
- Computer access for writing reports and research using databases and the Internet
- Public health officials and health care providers to present their role in dealing with viruses

Expectations of Students (including final product) As a result of the project, students will:

- Develop a public health awareness campaign--newsletters, brochures and speeches;
- Address multiple concepts, such as immunity, mutations and experimentation; and
- Analyze multiple sources of information and incorporate findings into a public health awareness campaign.

Role of Participating Teachers:

- **Allied Health** and **Biosciences** teachers will introduce information on viruses, assign virus to be researched and direct students to appropriate research materials.

- **English** teachers will develop a suggested reading list with sample questions and co-develop, administer and evaluate student progress throughout the project.

Linkages to Industry: A panel of health industry representatives--research doctors, lab technicians, public health/hospice nurses and epidemiologist--will share with students their role in public health and in the event of an outbreak. An editor from a newsletter, paper or journal will also explain their role in a public health awareness campaign.

Timeline: The project may take an entire semester or less to complete depending on the extent to which students must research.

Assessment strategies to determine student mastery of specified standards: Students will be required to submit on-going reports of their research, a final oral report and final public awareness materials. Public health officials and health care providers will provide assistance and feedback to students on their final products (public health brochure).

Social Studies/Health-Bioscience

Title: ***Ethnocentricity/Ethics and the Spread of AIDS***

Activities: As a part of this project, students will:

1. Investigate the history of the World Health Organization and its role in global health issues;
2. Research and report on the symptoms, transmission and variation in treatment of AIDS;
3. Discuss the cultural and social ramifications of the spread of AIDS;
4. Analyze a case study on AIDS and give an oral report on findings; and
5. Learn about the role of health care professionals and industry in combating the spread of AIDS and the treatment of those infected (guest lecture).

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - USH. 1.2 The student will analyze political change related to intellectual, social, and economic conditions during major historical periods.
  - USH. 2.2 The student will examine the historic role of the United States in world affairs.
  - WH. 3.3 The student will assess the impact of technology in shaping regional and global cooperation, conflict, and interdependence.
  - Sci. 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.2 The student will evaluate ideas, information, issues, and positions critically.

- **Industry Skill Standards: Health-Bioscience**
  Health care workers will understand the legal responsibilities, limitations, and the implications of their actions within the health care delivery setting. They will perform duties according to regulations, policies, laws, and legislated rights of clients.

Resources and materials to be used (including human resources)

- Text including books on AIDS, case studies and periodicals
- Computer access for report writing and research using the Internet
- Health care professionals to present on their role in preventing and treating AIDS
- Videos on AIDS and examples of public information aimed at reducing the spread of AIDS
- Maps, Graphs and Charts depicting the spread of AIDS among different ethnic groups
- AIDS test

Expectations of Students (including final product) During the project, students will:

- Research and prepare an oral and written presentation of topic;
- Analyze a case study in order to solve the problem presented;
- Prepare notes and informed questions to ask guest speakers; and
- Graph and chart the global spread of AIDS.

Role of Participating Teachers:

- **Science** teachers will prepare a lab exercise concerning the transmission of disease.
- **Social Studies** teachers will have students read data and maps to chart the spread of AIDS.
- **Mathematics** teachers will have students graph the economical feasibility of a cure.
- **English** teachers will assist students with written reports and oral presentation skills.

Linkages to Industry: Health care professionals, public health officials and members of the legal community will discuss their role in dealing with AIDS and the ethical dilemmas they face in their work. In particular, health care procedures for patients with AIDS and legal issues concerning AIDS patients will be discussed.

Timeline: The project will take three weeks, allowing one week for student presentations.

Assessment strategies to determine student mastery of specified standards: Students will submit a portfolio which includes notes from all presentations, peer grading of other groups, a solution from the case study and an analysis of the spread and treatment of AIDS in another country.

Science/Health-Bioscience

Title: ***Effective Bacterial Screening Procedures***

Activities: As a part of this project, students will:

1. Demonstrate standard bacterial staining techniques and slide preparation;
2. Demonstrate methods of data collection (integrating mathematics and computers);
3. Demonstrate safety/universal precautions and quality control procedures;
4. Identify bacterial agents and modes of transmission;
5. Observe the effect of known and unintentional contaminants on slides;
6. Demonstrate methods of effective sampling (obtain statistically relevant samples from several areas such as food preparation areas, bathrooms, refrigerators and appliances).
7. Examine the effect of poor sampling and interpret data; and
8. Report on how bacterial agents are transmitted and the impact on daily life.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
  - Sci. 3.1 The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.
  - Sci. 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Biotechnology**
  Technical Skills (D): Basic Microbiology: Identify and quantify microorganisms and cells. Isolate, maintain and store pure cultures. Maintain and analyze fermentation materials. This also includes harvesting cells, transforming hosts, and performing bioassays.

Resources and materials to be used (including human resources)

- Biology, technology and mathematics books
- Computer access for writing reports and research
- Health department representative to discuss procedures and regulations they follow
- Food service personnel to discuss measures they take concerning bacteria
- Lab equipment for collection of samples and preparation of slides
- Field trip to related industry (students prepare questions prior to worksite visit)

Expectations of Students (including final product) As a result of this project, students will:

- Learn how to prepare and examine slides;
- Gather, record and interpret a variety of data sources; and
- Communicate results of research in written and oral reports.

Role of Participating Teachers:

- **Biology** teachers will guide the activity and provide industry site visits for students and guest presenters for classroom discussion.

- **Mathematics** and **Computer Science** teachers will provide students information on data collection techniques, statistical analysis and related software programs.

- **English** teachers will assist students in preparation and design of written and oral reports.

Linkages to Industry: Students will connect what they are learning to applications in food preparation, nutrition and health care facilities.

Timeline: This project will take two weeks to complete.

Assessment strategies to determine student mastery of specified standards: Students will complete a lab report, demonstrate proper lab techniques, develop questions for the presentation and discussion with guest presenters and give an oral report to the class and/or guests.

Science/Health-Bioscience

Title: ***Topics Out of the Hot Zone--Contaminants and Their Effects***

Activities: As a part of this project, students will:

1. Demonstrate specific techniques for using microscopes, slide preparation and staining;
2. Create team-based projects on the effects of contaminants in the environment and continuation of life on Earth;
3. Conduct research in which students identify contaminants, collect samples, generate and record data, evaluate data, communicate results and conduct ongoing assessment;
4. Relate their research to community and work-related applications using business or public policy representatives as sources of information and feedback; and
5. Present findings and implications of their research to class and community representatives.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
  - Sci. 3.1 The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.
  - Sci. 3.6 The student will investigate a biological issue and develop an action plan.
  - WH. 3.3 The student will assess the impact of technology in shaping regional and global cooperation, conflict, and interdependence.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.
  - SFS 5.2 The student will work cooperatively with others in a variety of group situations.

- **Industry Skill Standards: Biotechnology**
  Technical Skills (D): Basic Microbiology: Identify and quantify microorganisms and cells. Isolate, maintain and store pure cultures. Maintain and analyze fermentation materials. This also includes harvesting cells, transforming hosts, and performing bioassays.

Resources and materials to be used (including human resources)

- Microscopes and materials for slides and other laboratory equipment
- Alcohol or other contaminant(s)
- Business/industry representatives to present their role in dealing with contaminants
- Computer access for research on contaminant and development of presentation materials
- Biotech Council to judge students' acquisition of skills

Expectations of Students (including final product) As a result of this project, students will:

- Know the effects of contaminants on the environment and continuation of life;
- Demonstrate knowledge of data collection, research methods, reporting and presentation; and
- Demonstrate the ability to use a microscope and other laboratory equipment;

Role of Participating Teachers:

- **Science** teachers will cover laboratory techniques, salinity, contaminants and other concepts.
- **English** teachers will focus on written reports and communication skills.
- **Technology/Library/Media** teachers will assist students with research and Internet searches.
- **Mathematics** teachers will have students calculate and graph the impact of contaminants.
- **Social Studies** teachers will cover the history and impact of epidemics and pandemics.
- **Cooperative Education** teachers will arrange for industry visits and guest presenters.
- **Allied Health** teachers will have students read and analyze public health information.

Linkages to Industry: The project may encompass the work of numerous health and industry groups including the Environmental Protection Agency, Department of Health, Department of Natural Resources, Biotechnology Council and Chesapeake Bay Foundation.

Timeline: To be determined.

Assessment strategies to determine student mastery of specified standards: Students must meet established business criteria--the Biotechnology Council will evaluate projects to insure standards.

Mathematics/Health-Bioscience

Title: ***Personal Wellness Assessment Profile--A Ninth Grade Activity***

Activities: As a part of this project, students will:

1. Compare resting and active values for a variety of health measures including heart rate, blood pressure, breathing rate, body temperature and oxygen saturation;

2. Measure body fat, body weight, flexibility, strength and endurance for different groups of students based on training/sports interests, e.g., skaters, bikers, runners, gymnasts;

3. Keep a personal log of measurements and graph relationships between measurements;

4. Evaluate their own health/wellness status and determine the health implications of certain behaviors on health, e.g. smoking, diet and exercise;

5. Learn how the diagnostic measures listed above are used by health care professionals; and

6. Present--individually or in a group--results of research on the uses of diagnostic measures.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 1.2 The student will monitor progress, solve problems, and evaluate his or her own learning experiences.
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Health-Bioscience**
  Therapeutic Diagnostic Core: Therapeutic and diagnostic workers will understand the process for monitoring client health status. They will assess health status according to respective professional standards and report results to the treatment team.

Resources and materials to be used (including human resources)

- Health/medical equipment for measuring blood pressure, body temperature, oxygen saturation, weight, body fat, flexibility and strength
- Information on health measures and health comparisons by groups and across countries
- Health care professionals--EMT, nurse, doctor--to present information on the use of diagnostic tools

Expectations of Students (including final product) As a result of this project, students will have developed technical skills and a portfolio of their own health profile. Students will also learn to collect and report data in written and graph form and to report findings to an audience.

Role of Participating Teachers:

- **Mathematics** teachers will cover the relationship between variables, graphing, and predicting outcomes (may also link health indicators to calculation of insurance charts.)
- **Allied Health** teachers will assist students in measuring initial fitness levels and understanding body systems, disease processes and health goals.
- **Physical Education** teachers will supervise student physical activity performances.
- **Social Studies** teachers will have students compare health indicators across countries and examine cultural differences in diet, exercise and other health factors.
- **English** teachers will assist students in completing journals, portfolio's and presentations.

Linkages to Industry: Students will prepare questions and discuss the use of health indicators with a variety of health-related professionals.

Timeline: One semester--assess initial status, follow-up, and conclude with student presentations.

Assessment strategies to determine student mastery of specified standards: Examine student portfolios and evaluate team presentation and summary report.

Mathematics/Health-Biosciences

Title: ***Targeting Your Heart***

Activities: As a part of this project, students will:

1. Determine beginning resting heart rate (at start of project);
2. Learn how to calculate the target heart rate zone based on a variety of demographics;
3. Compare and contrast actual heart rate (resting to maximum) to develop a ratio;
4. Determine ending resting heart rate (at end of project);
5. Report measurement activities and explain changes;
6. Keep a log of data and calculate statistics based on data; and
7. Research--individually or in a group--a health condition and explain its effect on heart rate.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 1.2 The student will monitor progress, solve problems, and evaluate his or her own learning experiences.
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Health-Bioscience**
  Therapeutic Diagnostic Core: Therapeutic and diagnostic workers will understand the process for monitoring client health status. They will assess health status according to respective professional standards and report results to the treatment team.

Resources and materials to be used (including human resources)

- Polar Heart Rate Monitors (Vantage XL with interface)
- Computers with word processor and spreadsheet software to report project results
- Information/research on a variety of health conditions that affect heart rate
- Medical representatives to share information on the use of heart rate in diagnosis/treatment

Expectations of Students (including final product) As a result of this project, students will:

- Collect and report findings in written and graphic form;
- Learn the importance of a low resting heart rate to good health;
- Develop and follow a plan for cardiovascular fitness; and
- Report (written and oral) on a health condition and its effect on heart rate.

Role of Participating Teachers:

- **English** teachers will assist students in developing research and reporting (written and oral) skills.

- **Allied Health/Physical Education** teachers will cover what heart rate means--resting and target rates--and health implications as it relates to fitness level, overall health and disease. Students will learn how to use heart rate monitors and activities that are effective in adjusting heart rate.

- **Mathematics** teachers will have students calculate mean and ratios, solve equations, use spreadsheets and graphs for comparing and contrasting measurements.

Linkages to Industry: Emergency Medical Technicians (EMT) will visit the classroom to discuss the significance of vital signs in understanding and evaluating health. Medical/health occupations professionals will discuss diagnostic measures for the different health conditions researched by students. Industry representatives will discuss the role of wellness programs on productivity.

Timeline: The project will take one or two semesters to complete.

Assessment strategies to determine student mastery of specified standards: Students will be assessed on written and oral reports and on technical skill level in determining heart rate.

English/Health-Bioscience

Title: ***Devising An Action Plan for An Unknown (Radioactive) Contaminant***

Activities: As a part of this project, students will:

1. Learn about a variety of contaminants and potential environmental problems;
2. Visit an industry, research or medical laboratory to learn about precautions and procedures for dealing with contaminants;
3. Conduct laboratory experiments;
4. Research and report--as a group--on a particular contaminant and its effects; and
5. Determine and assign roles to members of the class for dealing with a contaminant.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.3 The student will explain and give evidence to support perceptions about print and non-print works.
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
  - Sci. 4.5 The student will investigate the impact of Chemistry on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 1.3 The student will apply acquired knowledge, skills and strategies effectively in new learning situations.
  - SFS 5.1 The student will demonstrate effective interaction strategies in groups.

- **Industry Skill Standards: Health-Bioscience/Environmental**
  Hazardous Materials Management/Regulations--Implement procedures to comply with appropriate regulations. This can include the following skills: obtaining permits and approvals, describing the regulatory process, or conducting audits and inspections to ensure compliance.

Resources and materials to be used (including human resources)

- Government and industry regulations/safety procedures for dealing with hazardous materials
- Computer access--Internet and review of news articles--to conduct research and collect examples of contamination
- Examination of events and effect of nuclear contamination--Hiroshima, Chernobyl and Three-mile Island
- Literature and film resources on the topic--*China Syndrome, Pandora's Box, Book Genesis*

Expectations of Students (including final product) As a result of this project, students will:

- Increase their knowledge of radioactivity (Bioeffects, physics);
- Use a variety of tools/sources including the Internet to research a topic;
- Conduct data collection and analysis--measure contamination level and project impact;
- Analyze information, make decisions, synthesize data and interpret a variety of evidence; and
- Write and present a plan of action based on research--including specification of protective gear, controlling/sealing an area, notifying authorities and clean up procedures.

Role of Participating Teachers:

- **Biology, Chemistry** and **Physics** teachers will introduce concepts and direct the students' data collection, laboratory experiments and data analysis.
- **Work-based Learning Coordinators** will arrange for laboratory site-visit and information on industry safety regulations and protocol.
- **English** teachers will assist students in researching and writing reports.

Linkages to Industry: Students will visit an industry, research or medical laboratory. Prior to the visit, students will prepare questions for scientists and laboratory technicians. Industry and health representatives will also present issues as they relate to their work (MOSHA, OSHA, NRC).

Timeline: The project will take two weeks to one semester to complete.

Assessment strategies to determine student mastery of specified standards: Students will conduct a mock trial with visiting professionals and present a final research report and action plan.

Science/Health-Biosciences

Title: Microscope Review--Hunting for Signs of Infection

Activities: As a part of this project, students will:

1. Participate in a scavenger hunt for single-cell organisms to mount on slides;
2. Illustrate a dichotomous sort using Venn diagrams;
3. Observe yeasts--stained and unstained--and sort dead and alive samples;
4. Communicate with a laboratory to collect information on patients with yeast infections;
5. Research issues in health care as it pertains to yeast infections (jigsaw activity);
6. Present patient data to student groups for analysis; and
7. Report on safety, hygiene, lab procedures and patient factors as they relate to infection.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Sci. 1.2 The student will pose scientific questions and suggest experimental approaches to provide answers to questions.
  - Sci. 3.1 The student will be able to explain the correlation between the structure and function of biologically important molecules and their relationship to cell processes.
  - Sci. 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Health-Bioscience**
  Scenario 12: Prepare a slide of a sample and controls and note steps taken to prepare the slides and staining. Compare and contrast the slides prepared and slides from an external supplier.

Resources and materials to be used (including human resources)

- Microscopes, slides, stains, yeast culture and other laboratory equipment
- Texts and computer resources for research--including Internet access
- Teacher-made scenarios, protocols, models and samples and graphic organizers
- Presenters from health care settings to discuss patient care as it relates to yeast pathogen

Expectations of Students (including final product) As a result of this project, students will:

- Prepare yeast slides--using staining techniques on onion root slides;
- Write a lab report on creation of slides and comparison of normal and cancerous skin cells;
- Draw a Venn diagram;
- Report (oral report to class) on infections based on research and patient information; and
- Interview health care professionals about the use of sterile and safety procedures.

Role of Participating Teachers:

- **Allied Health** and **Biology** teachers will work together to cover materials, conduct laboratory exercises and provide students access to health care professionals and laboratory settings.

Linkages to Industry: Students will visit and/or interview representatives from laboratories and health care facilities.

Timeline: The project components include basic skills (scopes, staining, lab skills, diagnostic skills) covered in four days, group research covered in four days and simulation/assessment in two days.

Assessment strategies to determine student mastery of specified standards: Students will complete laboratory exercises and reports, a research paper and interviews and/or observations from a health care setting.

Mathematics/Environmental

Title: ***Nutrient Pollutants in Local Streams--Nitrogen, Phosphorus, Pollution and Standards***

Activities: As a part of this project, students will:

1. Conduct a chemical analysis of Nitrogen and Phosphorus concentrations in two or three local streams in different areas--agriculture, urban/suburban and forest/buffer;

2. Calculate nutrient concentration in each stream and analyze and graph differences;

3. Evaluate the level of nutrients in each stream against regulatory standards, other streams in the community, Bay Program's Goals and nationally (information on the Internet);

4. Describe health and environmental effects of pollutants on a local, national and global level; and

5. Present research findings to class and members of the community--Tributary Strategy team.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Health-Bioscience/Environmental**
  Hazardous Materials Management--Evaluate hazardous materials and hazardous waste sample data. Use the following knowledge and skills: perform mathematical calculations; read and interpret blueprints, charts, curves, graphs, maps, plans and spreadsheets from plotted and tabulated data; collect, tabulate, and assist in the evaluation of data; check laboratory and/or field sample analyses by comparing to regulatory limits.

Resources and materials to be used (including human resources)

- Text--journals, literature and government/industry regulations--on environment and health
- Computer access for writing reports, presenting data charts, graphs and research
- LaMotte Test Kits and other laboratory equipment for the collection of data
- Watershed maps and information about global rates of pollution/water quality
- Resource professionals in environmental education, regulation and land areas (field site)

Expectations of Students (including final product) As a part of this project, students will:

- Collect and analyze multiple water samples and other data;
- Research the cause and effect of particular pollutants on water quality and health;
- Describe health and environmental effects of pollutants on a local and global level; and
- Present research and findings to class and local Tributary Strategy teams.

Role of Participating Teachers:

- **Environmental Science, Agriculture** and **Biology** teachers will cover concepts in chemistry and biology including nutrients and pollution control.
- **Mathematics** teachers will assist students in statistical analysis of variation in streams including graphing, determining range, mean and other data points.
- **Social Studies** teachers will have students review environmental/water supply issues as they have been addressed in the United States and in other societies.
- **English** teachers will assist students in producing written reports and in presenting student assessment/point of view in an oral presentation concerning environmental issues.

Linkages to Industry: Students will learn about environmental projects, research-oriented jobs, hazardous materials work, and work that focuses on water quality and community health.

Timeline: Two weeks or longer--each subject can go further in depth.

Assessment strategies to determine student mastery of specified standards: Students will be assessed on their ability to collect samples, calculate, graph, interpret and present research.

Science/Environmental

Title: Where in the World is E. Coli?

Activities: To complete this project, students will:

1. Learn about E. Coli and identify health problems associated with the bacteria;

2. Learn laboratory techniques--positive/negative testing and safety procedures;

3. Collect several water samples using a variety of sampling techniques;

4. Investigate solutions to health problems outlined above collecting information from interviews of science and health professionals, health department and sewage treatment facility documents and information from environmental groups;

5. Visit an industry, research or medical laboratory that deals with the above health problems; and

6. Report on the cause, effect and solutions to one of the health problems outlined above.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Sci. 1.2 The student will pose scientific questions and suggest experimental approaches to provide answers to questions.
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
  - Sci. 3.5 The student will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.
  - Gov. 3.1 The student will demonstrate an understanding of the relationship of cultural and physical geographic factors in the development of government policy.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.3 The student will demonstrate strategic thinking in to make effective decisions, solve problems, and achieve goals in a variety of situations.
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Health-Bioscience/Environmental**
  Technical Skills (D): Basic Microbiology: Identify and quantify microorganisms and cells. Isolate, maintain and store pure cultures. Maintain and analyze fermentation materials. This also includes harvesting cells, transforming hosts, and performing bioassays.

Resources and materials to be used (including human resources)

- Laboratory exercises--E. Coli identification kits, water quality and pH testing equipment
- Computer access for writing reports, graphing data and conducting research (Internet)
- Community organizations to provide information, interviews and student visits--Farmers and Agriculture Extension, health department and sewage treatment facility representatives.

Expectations of Students (including final product) As a result of this project, students will:

- Understand and use laboratory procedures for collecting and analyzing data;
- Conduct research on a particular health problem using multiple sources of information; and
- Develop an action plan for water quality improvement as it relates to a health problem.

Role of Participating Teachers:

- **Science** teachers will provide students background concepts, principles and laboratory experiences concerning bacteria, water quality and health/disease. Science teachers will also arrange for guest speakers from the community and a student visit to a laboratory.

- **Social Studies** teachers will have students learn about local geography, land use, current health issues, and state and local policies that impact water quality and health.

- **English** teachers will assist students in developing interviewing, researching, writing and reporting skills.

- **Mathematics** teachers will have students chart, graph and analyze water sample data.

Linkages to Industry: Students will examine the role of environmental and agricultural businesses, laboratories, health departments and sewage treatment facilities in water quality and health.

Timeline: The project will take two to three weeks to complete.

Assessment strategies to determine student mastery of specified standards: Lab techniques, interviewing, research and reporting skills will be assessed. A final action plan will be evaluated.

English/Environmental

Title: ***Pesticides--Always a Foe When You Don't Read the Label***

Activities: As a part of this project, students will:

1. Learn about the composition and effect of pesticides and other hazardous materials;

2. Read and evaluate the label, warnings and instructions for a "bottle" of hazardous pesticide; *Note: Prior to lesson, rewrite instructions/warnings, to include flaws, omissions and undefined terms.*

3. Evaluate the information provided to establish clear conditions, procedures and directions necessary for the safe handling and use of hazardous materials--including a purpose for using the substance in an authentic setting, such as on a football field;

4. Research terms and conditions for using hazardous materials in a variety of applications--students may visit agricultural or community setting in which pesticides are used;

5. Rewrite pesticide instructions so materials are handled and applied appropriately; and

6. Design/write warning signs and pamphlets to inform the public of an application area.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.3 The student will explain and give evidence to support perceptions about print and non-print works.
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 4.2 The student will assess the effectiveness of choice of details, organizational pattern, word choice, syntax, use of figurative language, and rhetorical devices in the student's own composing.
  - Sci. 4.5 The student will investigate the impact of Chemistry on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.1 The student will plan for successful communication experiences.
  - SFS 5.1 The student will demonstrate effective interaction strategies in groups.

- **Industry Skill Standards: Health-Bioscience/Environmental**
  Hazardous Materials Management/Regulations--Implement procedures to comply with appropriate regulations. This can include the following skills: obtaining permits and approvals, describing the regulatory process, or conducting audits and inspections to ensure compliance.

Resources and materials to be used (including human resources)

- Boxes with warning labels, instructions, documentation of contents, and safety procedures
- Business and community representatives who work directly with hazardous materials
- Signs of symbols used to designate hazardous materials and safety precautions
- Computer access for research and producing pamphlets and signs

Expectations of Students (including final product) As a result of this project, students will:

- Learn the scientific concepts and principles concerning hazardous materials and health;
- Read and critique information and directions based on knowledge of hazardous materials;
- Develop a set of final instructions to be used for appropriate handling of pesticides; and
- Communicate procedures for safe handling and use of hazardous materials.

Role of Participating Teachers:

- **Agriculture** and **Environmental Science** teachers will provide students with scientific concepts and principles concerning hazardous materials and documents from one or more pesticides.

- **English** teachers will assist students in interpretation and evaluation of technical writing and in revision of labels/instructions.

Linkages to Industry: Industry representatives will provide samples of instructions and labels from a variety of pesticides and other hazardous materials. Students will visit a laboratory or application setting to view safe and appropriate application of pesticides.

Timeline: The project will be completed in one to two weeks.

Assessment strategies to determine student mastery of specified standards: Industry/legal experts will evaluate student revisions for effectiveness and appropriate handling of hazardous materials.

English/Manufacturing

Title: ***Sweet Success--Operating a Cookie Company***

Activities: As a part of this project, students will:

1. Determine market supply and demand of cookies using surveys and cost assessments;
2. Form into groups or "companies" to select a product (type of cookie) to manufacture, and to plan production, distribution and communication procedures for the cookie company;
3. Visit a manufacturing setting to view the academic and technical skills required for success;
4. Develop record-keeping devices such as forms, memos and reports to track business success;
5. Develop sales/marketing materials--advertisements, mail order forms--for a product; and
6. Manufacture the product (cookies) for evaluation by "customers".

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.3 The student will explain and give evidence to support perceptions about print and non-print works.
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Math 3.1 The student will collect, organize, analyze, and present data.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 5.2 The student will work cooperatively with others in a variety of group situations.

- **Industry Skill Standards: Manufacturing**
  Communicate Information to Others: The worker will apply business and computer skills by developing a business plan, keeping records, designing and completing forms, giving oral reports, writing technical and non-technical reports, and maintaining positive customer relations.

Resources and materials to be used (including human resources)

- Computer access for student development of survey, tabulation of research results, creation of record keeping forms and creation of marketing/sales materials
- Representatives from manufacturing settings to give examples of forms and processes for record-keeping, customer relations, product development and health and safety regulations
- Ingredients and kitchen equipment and tools for production of cookies

Expectations of Students (including final product) As a result of this project, students will:

- Collect, analyze and interpret survey data to research and project business success;
- Create forms and a record keeping process to evaluate success of a business;
- Use mathematics for graphing, charting and projecting income and expenses for a business;
- Use computers for record keeping, communications and marketing for a company; and
- Write business letters and memos to stock holders, vendors and customers.

Role of Participating Teachers:

- **English** teachers will provide information and evaluation of communications--letters, memos and advertising text. English teachers will also coordinate activities between teachers.
- **Family and Consumer Sciences** teachers will have students determine recipes, production procedures and costs and have students make their product for evaluation by "customers".
- **Business/Marketing** teachers will provide instruction on procedures for manufacturing, distribution and communications and will arrange student visit(s) to an industry setting.
- **Art** and **Music** teachers will assist students in developing marketing/advertising materials.

Linkages to Industry: Industry representatives will provide information on all aspects of industry--through field trips, job shadowing or guest presentations--as students revise their "company" plans.

Timeline: Allow two weeks--including time for teachers to plan, prepare, act and evaluate.

Assessment strategies to determine student mastery of specified standards: Students will collect and analyze data and compose a variety of letters, forms, advertising texts and a final product.

Mathematics/Manufacturing

Title: Real World Geometry--Building Stairs

Activities: To complete this project, students will work in teams to:

1. Review construction and safety procedures as well as blueprint design/notations;
2. Select the type or location of stairs to be constructed--e.g. stadium stairs, residential split-level or apartment building fire-escape;
3. Use mathematical concepts and construction code guidelines to design the selected stairs;
4. Use measurement skills and concepts from geometry and algebra to produce a blueprint and to calculate the cost of constructing the stairs;
5. Construct a scale model of the stairs; and
6. Produce a one-page flyer/brochure--with a sketch of stairs, uses of the particular construction design and cost estimate--to be compiled into a booklet of stair designs, uses and costs.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Math 2.1 The student will represent and analyze two- and three-dimensional figures using tools and technology when appropriate.
  - Math 2.3 The student will apply concepts of measurement using tools and technology when appropriate.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Building supply companies as resources for sample designs and materials cost estimates
- Resource persons--carpenters, civil engineers, or building inspectors
- Construction equipment/tools for construction of scale model stairs
- Computer access for design (AutoCAD), cost calculations and producing a flyer/brochure

Expectations of Students (including final product) As a result of this project, students will:

- Learn about safety codes, building regulations and blueprint design;
- Use mathematical skills to design and construct stairs; and
- Use technical skills to construct a model of the steps.

Role of Participating Teachers:

- **Mathematics** teachers will cover concepts and principles in geometry and algebra.

- **Technology/Construction** teachers will assist students in the design and construction of the model stairs. Technology/Construction teachers will also coordinate student visit(s) to construction site(s) and industry representative presentations to students.

Linkages to Industry: Industry representatives will share with students information concerning design and construction including safety procedures and building codes. Students will collect material cost estimates from building supply stores--comparing costs between individual and commercial contractor prices.

Timeline: The project will take two to three weeks to complete including time to compile the student booklet on stair designs and cost.

Assessment strategies to determine student mastery of specified standards: Throughout the project, students must justify all designs and calculations and must identify and meet industry codes. The final products to be evaluated include the model stairs and a one-page description of stairs.

Social Studies/Manufacturing

Title: ***How Do Labor Unions Work?***

Activities: To complete this project, students will:

1. Learn about the history and role of labor unions in the United States;

2. Collect--scavenger hunt at work sites--current health and safety regulations that resulted from labor union efforts;

3. Research--using Internet and other sources of information--current labor issues and map current and previous union representation in the United States;

4. Role-play a re-negotiation of a contract. Act out the negotiations of a previous labor dispute and improvise a negotiation of a current labor dispute; and

5. Write a new labor constitution based on negotiations.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 4.1 The student will describe the effect that a given text, heard or read, has on a listener or reader.
  - Gov. 1.1 The student will demonstrate understanding of the structure and functions of government and politics in the United States.
  - USH. 1.2 The student will analyze political change related to intellectual, social, and economic conditions during major historical periods.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 1.3 The student will apply acquired knowledge, skills and strategies effectively in new learning situations.
  - SFS 5.1 The student will demonstrate effective interaction strategies in groups.

- **Industry Skill Standards: Manufacturing**
  The worker will demonstrate an understanding of health, safety, and legal requirements with regard to processes, products, and people, with attention to 1) health and safety requirements and procedures, including those established by local, state and federal regulations; 2) potential health and safety hazards; 3) confidentiality of proprietary information; and 4) company-established safety practices.

Resources and materials to be used (including human resources)

- Text--history, documents and literature (*The Jungle* by Sinclair)--concerning labor unions
- Film excerpts from *Far and Away*, *Norma Rae* and other films about labor unions
- Industry leaders--union and non-union--to present information on current labor issues, FDA and other regulations, work permits and I-9 forms
- Computer access for research (using Internet and other sources) and writing reports
- Posters and other information from the department of labor

Expectations of Students (including final product) As a result of the project, students will:

- Learn about the historical development of industry practices and standards;
- Develop writing and persuasive argument skills through essays and debates; and
- Develop critical thinking skills through negotiation of labor disputes.

Role of Participating Teachers:

- **Social Studies** teachers will outline the project, coordinate implementation of the project between teachers and have students review the history and current issues of labor unions.

- **Work Experience/Technical Education** teachers will set up interviews of industry and labor representatives, organize student visits to work sites and provide information on labor issues and regulations (guidance counselors may have information on careers and work permits.)

- **School Administrators** will provide transportation and coverage during industry visit(s).

Linkages to Industry: Students will interview union and non-union representatives and will visit work sites to view practices that resulted from union demands and to examine current union issues.

Timeline: The project will take approximately two weeks to complete including research, industry visits, contract negotiations and development of a new labor contract.

Assessment strategies to determine student mastery of specified standards: Students will develop a portfolio including a series of essays on historical and current labor issues and a new labor contract.

Science/Manufacturing

Title: ***Cranes are Booming***

Activities: As a part of this project, students will:

1. Be presented with the following problem: *The school system must rent a crane capable of removing air conditioning units from all schools in the county. Students will be given specific details of a "worst case scenario"--if their crane will work at this school it will work at all schools.*

2. Research all aspects of the problem, including equipment design and costs. Students may witness a demonstration of equipment use or visit a worksite where cranes are in use;

3. Design and construct a model crane to test effectiveness of a particular type of crane given the task and cost limitations;

4. Keep a journal of designs, cost estimates, trial test data and justifications for model design;

5. Prepare a report and supporting documents for a presentation--a brochure, cost analysis, written information, and graphical analysis; and

6. Present the prototype before a board (crane rental committee) to win a bid for the job.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 5.1 The student will know and apply the laws of mechanics to explain the behavior of the physical world.
  - Sci. 5.6 The student will investigate the impact of Physics on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Industry and business consultants for on-going consultation and project evaluators
- Computer access for design (AutoCAD) and production of reports and brochures
- CBL Units (T_i Graphing Calculators)
- Hardware for construction of model cranes

Expectations of Students (including final product) As a result of this project, students will:

- Understand specific concepts and principles of mathematics and physics;
- Use design and performance specifications for heavy machinery to construct model cranes; and
- Develop analytical, writing and communication skills in preparation for a presentation.

Role of Participating Teachers:

- **Physics** teachers will cover the scientific concepts and principles required to collect and analyse data concerning the effectiveness of cranes.
- **Technology Education** teachers will reinforce physics concepts as part of constructing a crane.
- **Mathematics** teachers will assist students in data analysis, graphing and statistics.
- **English** teachers will assist students with journals, brochures and presentations.
- **Art** teachers will guide students in the design of brochures and presentation materials.

Linkages to Industry: Student will visit work sites and industry consultants will assess progress.

Timeline: The project may range from four weeks to one semester in length.

Assessment strategies to determine student mastery of specified standards: Students will submit a data analysis report in support of their design and present report to industry representatives.

English/Manufacturing

Title: ***Employee Outreach for High Performance Manufacturing***

Activities: As a part of this project, students working in teams will:

1. Learn about industry hiring and personnel practices;
2. Examine the skill level required for a variety of jobs (across industries or for one industry);
3. Design an employee outreach plan--including an employee interview form--to help employers hire and retain skilled workers;
4. Implement an outreach plan, administer a survey, and collect data on its effectiveness; and
5. Present the employee outreach plan--including survey results--to industry representatives.

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.1 The student will use effective strategies before, during, and after reading, viewing, and listening to self-selected and assigned materials.
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 3.1 The student will demonstrate understanding of the nature and structure of language, including grammar concepts and skills, to strengthen control of oral and written language.
  - Math 3.1 The student will collect, organize, analyze, and present data.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.1 The student will plan for successful communication experiences.
  - SFS 3.3 The student will monitor, problem-solve, and evaluate communication experiences.

- **Industry Skill Standards: Manufacturing**
  Communicate Information to Others: The worker will apply business and computer skills by developing a business plan, keeping records, designing and completing forms, giving oral reports, writing technical and non-technical reports, and maintaining positive customer relations.

Resources and materials to be used (including human resources)

- Information on hiring and personnel practices for one or more industry/job market--wages and incentives, demography of workforce, market base (local/international) and profitability.
- Industry representatives to present information on skill requirements for variety of jobs
- Computer access (Internet) for student research of a particular industry/job market and for developing written reports and employee survey

Expectations of Students (including final product) As a result of this project, students will:

- Understand the necessity of being lifelong learners and the changing needs of the industry;
- Develop a survey and conduct interviews to determine effectiveness of an outreach plan;
- Present--using visual support technology--an employee outreach plan and results of a survey; and
- Demonstrate research skills using a variety of data sources.

Role of Participating Teachers:

- **English** teachers will assist students in the development of the employee survey, interviewing skills, writing and presentation skills.
- **Mathematics** teachers will assist students in survey research analysis and collection and presentation of other data on employment and job markets.
- **Social studies** teachers will cover concepts of economic indicators and development, the global economy and labor supply and demand.
- **Business** teachers will cover issues in marketing, customer relations, and recruitment.
- **Technology Education** teachers will provide information on aspects of industry and labor relations.

Linkages to Industry: In researching a particular industry, students may participate in an industry visit or job shadowing. Industry and/or labor representatives will present on all aspects of industry, labor relations and assist instructors in project assessment.

Timeline: The project will take one month to complete.

Assessment strategies to determine student mastery of specified standards: Human resource personnel will provide evaluation of outreach plan.

Mathematics/Manufacturing

Title: ***Modular House Design Team Project***

Activities: As a part of this project, students working in teams will:

1. Learn about industry standards for constructing a house--each team will be given a different style house to design;

2. Calculate specifications for each type of house--size, cost, capacity, function and materials;

3. Visit construction sites to view all aspects of design and construction including masonry, framing, electrical, plumbing and HVAC;

4. Develop/draft house design plans (for each type of house); and

5. Present final house design and specifications to "home buyers".

Academic and Industry Skill Standards addressed in the project: (Expectations for Learning)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Math 1.1 The student will analyze a wide variety of patterns and functional relationships using the language of mathematics and appropriate technology.
  - Math 2.1 The student will represent and analyze two- and three-dimensional figures using tools and technology when appropriate.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.1 The student will understand and evaluate the uses of current technologies for a variety of purposes and situations.
  - SFS 5.2 The student will work cooperatively with others in a variety of group situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Information on design and construction specifications
- Computer access for design (CAD program) and development of presentation materials--costs analysis, materials list and other information
- Industrial consultant to present on different aspects of design and construction and to provide construction site for students to view construction process

Expectations of Students (including final product) As a result of this project, students will:

- Develop mathematical skills by meeting industry standards for the construction of a house;
- Use a CAD system to create designs of a housing unit which meets established standards; and
- Work in teams to complete all aspects of a construction process.

Role of Participating Teachers:

- **Mathematics** teachers will assist students in using geometry and algebraic equations in completing designs and cost estimates.

- **English** teachers will assist students in interpreting technical writing and developing presentation materials.

- **Art** and **Technology Education** teachers will assist students in drawing and developing house designs. Technology teachers will coordinate student visits to work site.

Linkages to Industry: Industry consultants will assist students at various stages of the project and will evaluate the final designs and presentations.

Timeline: Two to three weeks depending on school schedules.

Assessment strategies to determine student mastery of specified standards: Group designs and presentations will be evaluated by teachers and industry representatives.

Science/Manufacturing

Title: ***Thinking Outside the Box--Designing Containers for Life***

Activities: As a part of this project students will work in groups to:

1. Establish a manufacturing and distribution company that will design and construct a container for transporting human organs for transplant;

2. Have each "company" use market research (interviews with medical suppliers and hospitals) and principles from business to organize the company, design a logo and develop a marketing plan for the container(s);

3. Research industry practices for shipping/distribution including a visit to industry to gather examples of designs and practices (in particular the scientific concerns for preserving organs);

4. Use accounting procedures to calculate/project production costs and to budget for a marketing plan; and

5. Construct shipping containers based on the "company" design(s) and develop marketing materials to support the business.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 3.6 The student will investigate a biological issue and develop an action plan.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.2 The student will use technology effectively for a variety of purposes/situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Design materials--computers, graph paper, spread sheets, and manufacturer visits
- Construction materials--cardboard, packing materials, and lab supplies
- Business/marketing materials--general ledger, marketing design, art supplies

Expectations of students (including final product) As a result of this project, students will:

- Design and construct a container which will meet the needs of transporting organs;
- Demonstrate the ability to plan and implement a marketing and manufacturing plan that satisfy industry needs; and
- Work successfully in groups to research, plan and implement a project.

Role of Participating Teachers:

- **Science** and **Mathematics** teachers will present and coordinate the project, including establishing industry visits and laboratory exercises for construction of containers. They will also cover concepts in geometry, graphing, calculating strength and thermodynamics.

- **Business** and **Technology Education** teachers will guide students in researching product design, composing marketing materials and construction of the container(s).

Linkages to Industry: Business and manufacturing partners will facilitate students visits and provide information for student research and design.

Timeline: The project will include one week for data collection and one week for project implementation (manufacturing).

Assessment strategies to determine student mastery of specified standards: Students will be assessed on performance of assigned tasks, problem-solving according to time limits and industrial needs. Culmination activity is to submit the best container design to a manufacturer to create proto-type.

Science/Health-Bioscience

Title: Thermo-Duo--Manufacturing a Thermal Cup

Activities: As a part of this project, students will:

1. Collect and examine several designs or samples of thermal cups, noting the degree to which they keep beverages hot or cold;

2. Compile and analyze product effectiveness data in form of graph/and or chart;

3. Visit an insulation company and examine ways to improve efficiency of the cup;

4. Work in groups to design and construct a thermal cup for hot or cold beverages; and

5. Produce marketing materials to illustrate the effectiveness of the group's cup and have "customers" place orders based on the marketing materials and the product.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 5.3 The student will recognize and relate the laws of thermodynamics to practical applications.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Microwave, refrigerator, thermometers
- Computer software for statistical analysis, graphing, and graphic arts
- Representative of manufacturing company (engineer) to design and insulating materials
- Marketing representative to share examples of marketing materials

Expectations of Students (including final product) As a result of this project, students will:

- Design and manufacture a thermal cup;
- Collect, analyze and interpret data; and
- Use computers for record keeping, sales and marketing.

Roles of participating teachers

- **Music** and **Art** teachers will facilitate student production of marketing materials.
- **Math** teachers will cover budgets and statistical analysis of production and sales.
- **Science** teachers will assist in data collection, experimental design and physics principles.
- **Technology Education** teachers will coordinate industry visits and direct students through the production process.

Linkages to industry: Students will visit manufacturing setting(s) and will interview representatives to learn about production and marketing. Partnership companies may assist with funding for materials needed to manufacture the cups.

Timeline: This project will require five days of teacher/partner planning and five days for student work.

Assessment strategies: The students will collect and analyze data and present their designs and marketing materials in a school-wide exposition. Also, included would be the manufacturing, scientific, and mathematical discoveries, application and their connections resulting in production of the thermo duo cup. Student groups may test and "sell" their cup to determine the most effective and the most profitable.

English/Manufacturing

Title: ***Keys for Success--Manufacturing Keychains with School Logo***

Activities: As a part of this project, students will:

1. Conduct market surveys to determine customer desire for a variety of keychain designs;
2. Write business letters to suppliers and vendors to gather information on the design and sales of keychains and to gain financial support for the production of keychains;
3. Work in groups to form "companies", design letter head, business cards and company reporting procedures;
4. Design and manufacture a keychain (each "company");
5. Write and produce commercials for radio or television and brochures or flyers for print advertisements; and
6. Sell keychains and produce a final report for investors.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 3.1 The student will demonstrate understanding of the nature and structure of language, including grammar concepts and skills, to strengthen control of oral and written language.
  - Eng. 3.3 The student will use capitalization, punctuation, and correct spelling appropriately.
  - Math 3.1 The student will collect, organize, analyze, and present data.
- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 2.1 The student will generate and evaluate creative ideas in a variety of situations.
- **Industry Skill Standards: Manufacturing**
  Communicate Information to Others: The worker will apply business and computer skills by developing a business plan, keeping records, designing and completing forms, giving oral reports, writing technical and non-technical reports, and maintaining positive customer relations.

Resources and materials to be used (including human resources)

- Computer access to desktop publisher and presentation programs (such as powerpoint) and spreadsheet programs for business accounting
- Injection molding machine and tools for production

Expectations of students (including final product) As a result of this project, student will:

- Calculate data/calculate needs for start up and production;
- Create business forms for their company (letterheads, business cards, and memos);
- Use mathematics for graphing, charting, and projecting supply and demands and determine diminishing returns;
- Present--visually and orally--using presentation programs, desktop publishing and graphic arts designs; and
- Understand business procedure of small business, set-up, use of special sheets, directions of business/industry standards.

Roles of participating teachers

- **Mathematics** teachers will assist student in calculating supply/demand, diminishing returns, and amount of raw materials needed.

- **English** teachers will assist student in letter format, proposal writing, and speech/presentation skills.

- **Art** teachers will help student with designs of keychains, color selection, artwork on brochures and flyers

- **Technology Education** teachers will help student with designs and manufacturing of keychains.

Linkages to industry: Small businesses and manufacturers will offer students the opportunity to see business and production process first-hand through industry tours and interviews. Local financial institutions may assist students with business plans and production costs.

Timeline: The project will require one week of planning/coordination time and two weeks of student research, industry visits, production and sales.

Assessment strategies: Business partners and "customers" will evaluate each company's business forms, brochures and oral presentations. Mathematical calculations, graphing and charting (projecting supply and demands) will be reviewed for accuracy. Customer satisfaction with finished product and team effectiveness will be assessed.

Math/Manufacturing

Title: Tinker Toys--Designing Toys for Tots

Activities: As a part of this project, students will:

1. Form teams to research and supply background information including rationale for selecting a particular toy to manufacture (based on market demand);

2. Visit a manufacturer and/or invite appropriate guest speakers to learn about design and production of toys;

3. Develop a record for material and time required and a work plan with time lines;

4. Design and manufacture toys; and

5. Evaluate/test each toy in child care classes to determine the highest quality and appeal for children and parents.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 2.2 The student will apply geometric properties and relationships to solve problems using tools and technology when appropriate.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Computer access/Internet access for research and design of toys and marketing materials
- Guest speakers, industry partner to assist with visits to manufacturing setting
- Tools for design (geometric shapes) and production of toys

Expectations of students (including a final product) As a result of this project, student will:

- Identify and utilize geometric shapes in their design of toys;
- Use research to determine the validity of the project;
- Enhance communication skills: letter writing, memos and presentation; and
- Manufacture a toy and develop a marketing plan.

Roles of participating teachers

- **English, Art and Business** teachers will assist students with letters, memos, marketing and presentation skills. Business teachers will also direct students with business plans.
- **Social Studies** teachers will direct students in research regarding history of safety regulations and requirements for toys.
- **Technology Education** and **Art** teachers will assist students with designing and manufacturing (engineering/assembly process) of toys.
- **Child Care** teachers will have students assist in child and parent evaluation of the toys.

Linkages to industry: Industry representatives will provide information on all aspects of the industry through field trips, guest lectures.

Timeline: Allow 2 weeks--including time for students and teachers to plan, prepare, act evaluate.

Assessment strategies: Toys will be tested, evaluated by children in Child Care classes for durability, amount of interest displayed in toy and parent satisfaction.

English/Manufacturing

Title: Drink Links--Manufacturing Sports Bottles

Activities: As a part of this project students will:

1. Divide/group into company structure--with manufacturing, marketing/sales and accounting divisions;

2. Develop and execute a needs/demands survey to determine the target consumer audience;

3. Plan production, distribution and communication procedures for bottle company, including researching the legal aspects of product development and marketing issues. Students will also visit manufacturing site(s) to determine required skills and cost effectiveness;

4. Plan and implement record keeping devices and marketing/sales materials (hold a design competition--which includes logo, color, and bottle design combination); and

5. Conduct a mock sale of water bottles to determine most successful company design marketing and business procedures.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.1 The student will collect, organize, analyze, and present data.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.3 The student will demonstrate strategic thinking to make effective decisions, solve problems, and achieve goals in a variety of situations.

- **Industry Skill Standards: Manufacturing**
  Information Technology: The worker will be able to define the scope of work to meet the customer requirements and will review and provide input to user documentation.

Resources and materials to be used (including human resources)

- Maryland Small Business Administration, Industry partner and Local Advertising Agency professional
- Computer access for student development of materials (web site, CAD design, graphic arts, word processing, spreadsheet, data base)

Expectations of students (including final product) As a result of this project, students will:

- Collect, analyze, and interpret survey data to plan, produce the product, and project business success;
- Create forms and a record keeping process to evaluate success of a business;
- Use mathematics for graphing, charting and projecting income and expenses for a business; and
- Use computers for record keeping, communications, marketing for a company, and product design.

Roles of participating teachers:

- **English** teachers will have students develop oral and written communication skills--advertising materials, survey design and sales materials.
- **Technology/Manufacturing** teachers will conduct the research and design (and production if possible) phase.
- **Business** teachers will review the overall business plan, marketing strategies and record keeping forms and accounting for each company.
- **Graphic Arts** teachers will supervise student work on advertising and logo design.

Linkages to industry: Students will participate in a job shadowing experience in a business/manufacturing setting to learn about modern business and manufacturing practices. Guest presenters may also share ideas for business design and marketing materials.

Timeline: The project (including industry visits) will take three weeks to complete.

Assessment strategies: Students will be assessed on the quality and accuracy of their work in collecting and analyzing data, composing various communications for the appropriate audience, and consumer evaluation (sales) of the final product.

Math/Manufacturing

Title: ***From the Ground Up--New Renovations in an Old Space***

Activities: As a part of this project, students will:

1. Investigate the use/creation of new space in a building (e.g. health care center, computer lab, child care center, snack-bar);

2. Survey school administrators and students to determine school renovation needs;

3. Form groups to investigate local government restrictions, environmental issues, costs, building and plot limitations and blueprints to determine impact of design(s);

4. Develop record-keeping devices such as forms, memos, and reports to track progress;

5. Design/present solutions to problem(s) based on mathematic, geometric, environmental and other findings determined in investigations; and

6. Present design(s) to administrators and students.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 2.1 The student will represent and analyze two- and three-dimensional figures using tools and technology when appropriate.
  - Math 2.2 The student will apply geometric properties and relationships to solve problems using tools and technology when appropriate.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 2.3 The student will demonstrate strategic thinking in to make effective decisions, solve problems, and achieve goals in a variety of situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Representatives from contracting, environmental and financial companies, government officials, community improvement officials, and an architectural firm
- Computer access for student development and investigation of blueprints, plot tabulation of research results and creation of record keeping forms and presentation material
- Communication resources (phone, mail, e-mail)

Expectations of students (including final product) As a result of this project, students will:

- Collect, analyze, and interpret data to research and design space in a building;
- Create forms and a record keeping process to evaluate success and obtain permits and information pertinent to project;
- Calculate areas analyzing expenses and adhering to space and other restrictions;
- Use computers for records, communication, and design programs; and
- Write letters and memos to obtain permits, persuade others for change, and inform others of progress.

Roles of participating teachers

- **English** teachers will provide information and evaluation of communications--letters, memos, verbal communication and use of audio/visual technology.

- **Mathematics** teachers will provide information and evaluation of calculation, graphs, space analysis, budgets, and charting.

- **Construction Trades** teachers will provide design programs, materials production, land surveys, and blueprint skills.

- **Social Studies** teachers will assist students in survey design, researching local government procedures and regulations and issues which impact the community.

Linkages to industry: Industry representative will provide information on all aspects of industry and add credibility to the impact of lessons through field trips, job shadowing, and guest presentations, as students investigate and solve problems to complete their design.

Timeline: One day to one semester--time would vary depending on the complexity selected by the teacher group and students needs.

Assessment strategies: Students will collect and analyze data and compose a variety of letters, forms. Group cooperation and participation will be assessed in relation to the completion of the final project. The final project will be assessed as presented by the group members.

Science/Manufacturing

Title: ***Designing a Sports Drink for a New Era***

Activities: As a part of this project, students will:

1. Conduct research on marketing and advertising strategies of sports drink manufacturers, including a visit to a beverage manufacturer and/or distribution and bottling facilities;

2. Conduct laboratory experiments to determine nutrients and other ingredients in a variety of sports drinks to determine optimal ingredients for a new beverage;

3. Establish company procedures for record keeping, manufacturing, advertising, and distribution of the product;

4. Produce a new sports drink; and

5. Develop marketing/sales materials, market the product and evaluate market response or success of the product design.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Sci. 1.4 The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
  - Sci. 3.6 The student will investigate a biological issue and develop an action plan.
  - Sci. 4.5 The student will investigate the impact of Chemistry on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 1.2 The student will monitor progress, solve problems, and evaluate his or her own learning experiences.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Information Technology: The worker will be able to define the scope of work to meet the customer requirements and will review and provide input to user documentation.

Resources and materials to be used (including human resources)

- Representatives from manufacturing settings to discuss manufacturing process, distribution, paperwork/records, licensing and advertising practices
- Computer resources to conduct market research (integrated software application package)
- Laboratory testing kits, ingredients and processing equipment

Expectations of students (including final product): As a result of this project, students will:

- Select, set up, and perform diagnostic tests as part of research and data collection process;
- Analyze data to solve problems, including interpreting survey data;
- Apply math concepts to graphs, charts, and project income and production costs;
- Perform recordkeeping and marketing of the company, communicate using integrated software applications, implement the scientific method to draw conclusions; and
- Develop questionnaires to be used during industry visit/guest speaker to gain information on issues to address in developing and marketing beverage product.

Roles of participating teachers

- **Biology and Chemistry** teachers will introduce science concepts and direct the students' data collection and lab experiments.
- **Business and Mathematics** teachers will guide students through the use of computer applications software, development of business forms and survey design and analysis.
- **English and Graphic Arts** teachers will guide marketing and communications efforts.
- **Social Studies** teachers will help students research licensing, government regulations and production history.
- **Family and Consumer Science** teachers will cover nutritional guidelines and beverage production process. They will also coordinate the industry visits.

Linkages to industry: Industry representatives will provide information on all aspects of the beverage industry. Students will visit a beverage industry company and will seek a business sponsor to support production efforts. Students will prepare questions to gain information on marketing, design, and product feasibility.

Timeline: The project will take two weeks to complete.

Assessment strategies: Students will be assessed on their ability to collect and analyze data, collect samples, calculate, graph interpret research, present research, and communicate in writing and orally. They will also be assessed on the production and marketing of the final product.

Science/Manufacturing

Title: ***Getting a Charge for Life--Battery Science and the Heart***

Activities: As a part of this project, students will:

1. Define parameters for the electric impulse needs of the human heart;

2. Identify and research battery types--classify according to use, applications, voltage testing, current testing, and relative cost;

3. Analyze and present charts and graphs depicting the differences in each battery type and the degree to which they are appropriate for use in heart monitors; and

4. Design a heart monitor/stimulator using the most appropriate battery.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Sci. 3.6 The student will investigate a biological issue and develop an action plan.
  - Sci. 5.2 The student will know and apply the laws of electricity and magnetism and explain their significant role in nature and technology.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.4 The student will solve problems systematically and rationally.
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Medical consultant/presenter
- Internet access, electrical test equipment, variety of battery types
- Chemical test materials, industrial battery representative

Expectations of students (including a final product) As a result of this project, students will:

- Research heart monitoring/charging equipment and power sources (batteries);
- Keep a daily learning journal including research findings and design for new equipment; and
- Present findings and new design.

Roles of participating teachers

- **Science** teachers will introduce concepts from biology, chemistry and physics and direct the data collection, laboratory experiments and data analysis.

- **Technology Education** teachers will facilitate internet research, computer electronic presentations and design of new equipment.

- **Health Occupations/Allied Health** teachers will introduce anatomy and physiology aspects and will coordinate examination of health monitoring equipment.

Linkages to industry: Health occupations representatives including doctors, nurses, emergency medical technicians, will provide information on the impact of the product as it relates to the human body. Manufacturer will provide information on all aspects of the industry as it relates to analysis and selection of the product and final recommendation/evaluation of product.

Timeline: The project will require two weeks to complete.

Assessment strategies: Individual and group assessments will be demonstrated by: learning journals, presentations, and a representative of industry judging new equipment design.

Math/Manufacturing

Title: Developing a Computer Repair Business

Activities: As a part of this project, students will:

1. Conduct a feasibility study for the establishment of a computer repair business--researching funding/costs, labor regulations, zoning laws, child labor/regulations, occupational safety regulations, public school regulations, and Federal Trade Commission (FTC) regulations;

2. Determine the supply/demand for a new computer repair business in the area of the school;

3. Visit an existing repair company, computer trade show(s), company(s) that access services to gain information for designing a new company;

4. Develop a business plan including job description/staffing and qualifications, analysis of market survey, cost/benefit analysis, record keeping systems, suppliers, building plant layout;

5. Develop and distribute marketing materials to advertise and acquire business partners and potential customers; and

6. Project the success/failure of the company based on analysis and present findings to potential investors.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations**:
  - Eng. 2.3 The student will locate, retrieve, and use information from various sources to accomplish a purpose.
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.

- **Skills for Success Core Learning Goals (SFS) and Expectations**:
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.
  - SFS 2.3 The student will demonstrate strategic thinking to make effective decisions, solve problems, and achieve goals in a variety of situations.

- **Industry Skill Standards: Manufacturing**
  Information Technology: The worker will be able to define the scope of work to meet the customer requirements and will review and provide input to user documentation.

Resources and materials to be used (including human resources)

- Representatives/speakers from industry related fields
- Computers to process data, develop business plan, access Internet for research, and produce marketing materials (desktop publishing)
- Computer parts for identification and examples to repair

Expectations of students (including a final product) As a result of this project, students will:

- Survey, collect and analyze data to research project success;
- Develop a business plan that identifies company structure, funding sources, start-up costs and projected success; and
- Use math and computer skills to develop a business plan and project its success.

Roles of participating teachers

- **Social Studies** teachers will direct student research of legal and labor issues surrounding the development of a company.

- **English** teachers will assist students in the research and design of company materials (written communications).

- **Business/Marketing** teachers will cover the formulation of a business plan and graphics, advertising/marketing materials and will coordinate site visits.

Linkages to industry: Students will visit computer repair business/industry settings to learn about the necessary skills in those workplaces. Local businesses may also provide work-based learning opportunities for students interested in careers in computer repair/engineering.

Timeline: The class project will take two-three weeks to complete--planned for early in any term to allow for follow up in one 9 week period.

Assessment strategies: Students will collect a variety of data pertaining to writing a business plan. Students will submit lists of labor and legal issues which will affect the implementing of their business plan.

Science/Manufacturing

Title: ***Reducing Energy Costs--Watts the Best Way?***

Activities: As a part of this project, students will:

1. Conduct a survey of the number of occupants and types of appliances in households (class survey or community survey);

2. Visit an electrical plant and/or research and design division of a manufacturer of electrical appliances to learn about energy consumption and product design;

3. Measure and graph the power consumption of three types of appliances--heat producing (hair dryer), lights (incandescent, florescent), and mechanical;

4. Calculate the cost of operation of appliances during on/off peak times and analyze household electrical bills (What is the relationship between # of occupants and # of appliances to bill?); and

5. Write a final report outlining research findings and make recommendations for reducing energy consumption by household.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  - Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  - Sci. 5.2 The student will know and apply the laws of electricity and magnetism and explain their significant role in nature and technology.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.3 The student will demonstrate strategic thinking in to make effective decisions, solve problems, and achieve goals in a variety of situations.
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Manufacturing**
  Evaluate Quality of a Process/Product: The worker will select, set up, and perform diagnostic tests, including analysis and interpretation of test data and problems that require corrective actions.

Resources and materials to be used (including human resources)

- Industry/business representatives to assist with visits and sharing information on the manufacturing process and electrical services/use and costs
- Sample appliances and laboratory equipment for measuring electrical use (meters)
- Sample electric bills (or include this information on the survey to households)
- Computer access for developing charts, graphs and final reports

Expectations of students (including final product) As a result of this project, students will:

- Increase their knowledge of energy consumption and related costs;
- Conduct data collections and analyses--measure and graph energy consumption and costs;
- Use a variety of tools including computers, graphing calculators, software programs, and measuring devices; and
- Develop an action plan to reduce energy cost of a household.

Roles of participating teachers:

- **Science** teachers will introduce concepts from physics and direct student data collection, laboratory experiments, and data analysis.
- **English** teachers will assist students in writing the invitation letter for guest speakers, survey items and a final report or action plan .
- **Electronics** or **Technology Education** teachers will coordinate industry visits and direct student research and reporting of findings.

Linkages to industry: Industry representative will provide information on all aspects of industry, power generation, usage, transformation and conservation. School building facilitator engineer will give a presentation to students.

Timeline: The project will take seven to ten days (fifty minute period) to complete.

Assessment strategies: Students will collect and analyze data and present a final plan for their household. Industry partners will assist in evaluating the quality of student plans/final recommendations.

English/Manufacturing

Title: ***Picture This -- Framing Memories***

Activities: As a part of this project, students will:

1. Take a pretest on entrepreneurship and knowledge of business principles and practices;
2. Form teams or "companies" to research the steps to take in establishing a framing business and to create a business organizational chart;
3. Visit manufacturing settings and framing shops in the area to learn about production and safety practices as well as to get examples of product designs;
4. Develop company marketing strategies, production needs list, and record keeping devices;
5. Manufacture frame(s) based on the company design; and
6. Judge frames based on several criteria--best overall design, most creative or most unique.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 2.2 The student will compose texts using the pre-writing, drafting, and revision strategies of effective writers and speakers.
  - Eng. 3.1 The student will demonstrate understanding of the nature and structure of language, including grammar concepts and skills, to strengthen control of oral and written language.
  - Math 2.2 The student will apply geometric properties and relationships to solve problems using tools and technology when appropriate.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 4.2 The student will use technology effectively for a variety of purposes and situations.
  - SFS 5.3 The student will monitor, evaluate and plan improvements in group performance.

- **Industry Skill Standards: Manufacturing**
  Blueprints and Schematics: The worker will 1) determine sizes, materials and other requirements; 2) interpret drawings and symbols regarding layout, plan, production, and inspection; 3) relate mechanical drawings to a three-dimensional object; and 4) determine system operation from schematics.

Resources and materials to be used (including human resources)

- Computer access for research and development of product designs and marketing materials
- Product materials--wood, metals, ceramic, plastic, nails, screws, glue (supplies to be determined by students)
- Equipment and tools (in wood-working and/or metal shop)
- Partnerships with civic organizations, community groups and individuals for industry tours and support materials

Expectations of students (including a final project) As a result of this project, students will:

- Create, collect, analyze, interpret data to project success of a business;
- Revise and refine marketing plans;
- Apply knowledge of business, safety and product standards to develop appropriate forms and procedures; and
- Manufacture high quality, attractive, affordable variety of frames.

Roles of participating teachers

- **English** teachers will oversee student communication activities including seeking support from businesses, developing a marketing plan and producing a final presentation for the competition.

- **Mathematics** and **Science** teachers will coordinate data analysis and choice of materials for constructing frames.

- **Technology Education** and **Building Trades** teachers will oversee production, use of machinery and safety standards.

- **Business** teachers will assist students in development of business plans, marketing materials and production.

Linkages to industry: Students will visit manufacturers and framing shops to see production and business principles in action. Students may also participate in more advanced work-based learning opportunities such as internships as a result of their success in this project.

Timeline: The project will take approximately two weeks to complete.

Assessment strategies: Students will develop a portfolio including pictures of the final product, the company business plan and a learning log. Students will also be given a post-test on their knowledge of business. Formative assessment includes day-to-day notes and observations. Summative assessment includes the post-test and final product.

Math/Health-Bioscience

Title: Disease Detectives--HIV

Activities: As a part of this project, students will:

1. Form into groups to research a designated topic related to HIV--Biology of the Virus, Prevention, Transmission and Treatment, and History and Social Implications;

2. Learn about the role of different health care providers in dealing with the prevention and treatment of HIV patients;

3. Design a creative method of presentation of their information that includes graphs and charts showing results of statistical analysis, and visual presentations of concepts;

4. As a class, create a "risk scale" that plots personal risk on a chart--given research on transmission and other social factors contributing to the spread of HIV; and

5. Individually, write a personal reflection paper about what they have learned about the disease;

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Math 3.1 The student will collect, organize, analyze, and present data.
  - Math 3.2 The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations.
  - Sci. 3.6 The student will investigate a biological issue and develop an action plan.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.2 The student will evaluate ideas, information, issues, and positions critically.
  - SFS 3.2 The student will gather, manage, and convey information, using a variety of skills, strategies, resources, and technologies.

- **Industry Skill Standards: Health-Bioscience**
  Health care workers will understand the legal responsibilities, limitations, and the implications of their actions within the health care delivery setting. They will perform duties according to regulations, policies, laws, and legislated rights of clients.

Resources and materials (including human resources)

- Computer/Internet access for research and production of report and presentation materials
- Video camera, videotapes, VCR, monitor for presentations
- Reference books/journals (social issues resource series)
- Human Resource--HERO, Positive voices/Positive choices representatives, health care providers, and public health officials

Expectations of students (including a final product) As a result of this project, students will:

- Increase their knowledge of the biological and social factors surrounding HIV;
- Use a variety of resources including the Internet and human resources to research a topic;
- Use scientific principles and math skills to conduct data collection and analysis;
- Develop communication skills/presentation skills;
- Reflect on the impact on HIV on themselves, family and community; and
- Use a group process to do a project.

Roles of participating teachers:

- **Allied Health** teachers will coordinate the project--make group assignments, monitor progress of groups, arrange for guest speakers and provide resources for student research.

- **Mathematics** teachers will direct student data analysis and production of graphs and charts data.

- **English** teachers will provide the format for the student reflection paper and evaluate written work.

Linkages to Industry: Students will contact the following business and community partners to achieve their small group project--health care providers, social services and health facilities, HEROs, pharmacology businesses and public health officials.

Timeline: The project will take four to six weeks during the semester or during the HIV unit in a health-bioscience course.

Assessment strategies: Students will be assessed on their ability to collect data, graph, interpret, write and present research.

English/Environmental and Natural Resources

Title: ***Hazmats--The Good, the Bad and the Ugly***

Activities: As a part of this project, students will:

1. Research definitions and classification of hazardous materials and complete a personal inventory of hazardous materials found in each student's home;

2. Compose a letter to local businesses, corporations and government representatives requesting a description of hazardous materials used and disposal methods;

3. Collect and summarize current events articles on environmental issues and cases of improper treatment of hazardous materials;

4. Use government or industry report format/forms to report findings on hazardous materials--write case summaries based on current event articles; and

5. Write a report on the cost/benefits of hazardous materials and their use in home, industry, schools or other settings.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  - Eng. 1.1 The student will use effective strategies before, during, and after reading, viewing, and listening to self-selected and assigned materials.
  - Eng. 1.3 The student will explain and give evidence to support perceptions about print and non-print works.
  - Eng. 2.1 The student will compose oral, written, and visual presentations which inform, persuade, and express personal ideas.
  - Sci. 4.5 The student will investigate the impact of Chemistry on society.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  - SFS 2.2 The student will evaluate ideas, information, issues, and positions critically.
  - SFS 2.3 The student will demonstrate strategic thinking to make effective decisions, solve problems, and achieve goals in a variety of situations.

- **Industry Skill Standards: Environmental and Natural Resources**
  Hazardous Materials Management/Documents--Compile, record, and maintain required documents for hazardous materials and hazardous waste management activities. This can include the compilation and maintenance of field notebooks, incident documentation, manifests, laboratory data, or exception reports.

Resources and materials to be used (including human resources)

- Computer/Internet access for student research and writings reports and letters
- Resource professionals to provide information on hazardous materials
- Bulletin board to post findings and articles on hazardous materials

Expectations of students (including a final project) As a result of this project, students will:

- Identify local businesses, industries and other settings where hazardous materials are used and compose a form letter to gather information on each location;
- Research definitions and classifications of hazardous material;
- Describe health and environmental effects of use and disposal of hazardous materials on local and global levels;
- Report to local government or environmental agency for assessment of report findings; and
- Showcase current issues involved in the use and disposal of hazardous materials in the form of a bulletin board (showcase the benefits as well as the detrimental affects of hazardous materials).

Roles of participating teachers:

- **English** teachers will assist students in producing written letters, reports and appropriate presentations.
- **Social Studies** teachers will have students research current events in hazardous materials and governmental regulations and agencies.
- **Environmental**, **Science**, **Agriculture** and **Biology** teachers will cover scientific concepts related to hazardous materials including benefits, health issues and pollution control.
- **Mathematics** teachers will assist students in data collection and analysis.

Linkages to industry: Students will learn about hazardous materials use, benefits, abuse and disposal in everyday life. Students will learn about governmental and industry standards dealing with hazardous materials.

Timeline: The project will take two weeks or longer--each subject can go further in depth.

Assessment strategies: Students will be assessed on their ability to accurately complete acceptable governmental or industry forms and on their ability to conduct and present research.

Math/Environmental and Natural Resources

Title: ***To Air is Human--Measuring Air Quality***

Activities: As a part of this project, students will:

1. Develop a hypothesis about acceptable and unacceptable levels of air quality in different areas at each setting--a School, Residential or Commercial setting;

2. Use scientific research procedures to take air quality measurements over a specific period of time and in different settings;

3. Develop matrices of data and analyze the data using statistics and graphs;

4. Describe health and environmental effects of various air pollutants;

5. Present findings (data) both orally and in a written report.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  Math 1.2 The student will model and interpret real-world situations, using the language of mathematics and appropriate technology.
  Math 3.1 The student will collect, organize, analyze, and present data.
  Sci. 3.6 The student will investigate a biological issue and develop an action plan.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  SFS 4.2 The student will use technology effectively for a variety of purposes and situations.

- **Industry Skill Standards: Environmental and Natural Resources**
  Hazardous Materials Management--Evaluate hazardous materials and hazardous waste sample data. Use the following knowledge and skills: perform mathematical calculations; read and interpret blueprints, charts, curves, graphs, maps, plans and spreadsheets from plotted and tabulated data; collect, tabulate, and assist in the evaluation of data; check laboratory and/or field sample analyses by comparing to regulatory limits.

Resources and materials (including human resources)

- Air quality professionals--EPA, OSHA, Health and Fire Department representatives to share information on importance of measuring air quality in a variety of settings
- Air measuring devices--technology for data analysis
- Computers and graphing calculators for analysis and report writing
- Text sources--Internet, books, journals, government publications

Expectations of students (including a final project) As a result of this project, students will:

- Use appropriate equipment and statistical methods to collect and analyze data;
- Describe standards and effects of air quality; and
- Present findings (data) both orally and in a written report.

Roles of participating teachers:

- **English** teachers will assist students in producing written and oral reports and writing letters requesting information and/or inviting guest speakers to participate in the project.
- **Art/Media Specialist** will assist students in preparing visuals representation of data.
- **Mathematics** teachers will cover data collection and analysis techniques.
- **Environmental Science** teachers will cover concepts relating to air quality, properties of gases and health issues.
- **Social Studies** teachers will present historic issues, information regarding regulation agencies and career opportunities.

Linkages to industry: Students will learn about environmental projects, research oriented jobs, hazardous materials work, and work that focuses on air quality and community health, and career information through guest experts.

Timeline: The project will require a minimum of two weeks to complete.

Assessment strategies: Students will be assessed on their ability to collect and analyze data and present research findings orally and in writing.

Science/Environmental and Natural Resources

Title: ***What You Can't See in Your Drinking Water***

Activities: As a part of this project, students will:

1. Gather information from a plumber, health department officials, environmental scientist, water treatment plant representatives and/or the American Waterworks Association (AWA) to research water sources for the school and community;

2. Study physical facility specifications and learn about a variety of microorganism contaminants and potential environmental problems for each water source;

3. Learn and practice proper lab procedures and sampling techniques to obtain certification for water sampling; and

4. Produce an information booklet to present findings to the school and community to enhance public health.

Academic and Industry Skill Standards addressed in the project: (Area, Goal, and Expectation)

- **Academic Area(s) Core Learning Goals (CLG) and Expectations:**
  Math 3.1 The student will collect, organize, analyze, and present data.
  Sci. 1.3 The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
  Sci. 2.8 The student will know how to investigate an earth science issue to develop an action plan.

- **Skills for Success Core Learning Goals (SFS) and Expectations:**
  SFS 4.3 The student will demonstrate an understanding of the impact of technologies on individuals, society, and the environment.

- **Industry Skill Standards: Environmental and Natural Resources**
  Technical Skills (D): Basic Microbiology: Identify and quantify microorganisms and cells. Isolate, maintain and store pure cultures. Maintain and analyze fermentation materials. This also includes harvesting cells, transforming hosts, and performing bioassays.

Resources and materials (including human resources)

- Computer/Internet access for research and development of information booklet
- Science texts and reference materials including maps and journals, and governmental regulations information
- Human resources--water treatment plant representative or student visit, guest speakers from the Health Department, Department of Environment and other resources
- Culturing materials (test kits, lab equipment, LeMotts)

Expectations of students (including a final product) As a result of this project, students will:

- Increase their knowledge of microorganisms as contaminants and potential environmental problems;
- Learn about water distribution and treatment in nature, home and school;
- Conduct data collection and analysis to measure contamination levels and project environmental and health impacts; and
- Interpret a variety of evidence and present results in a variety of formats that will demonstrate their knowledge of microorganisms and contaminants.

Roles of participating teachers:

- **Biology** and **Environmental Science** teachers will conduct lab exercises, cover data collection techniques, and background information on microorganisms.
- **Social Studies** teachers will review environmental issues in society and assist students in researching government regulations.
- **Mathematics** teachers will supervise data and graphical analysis.
- **Allied Health** teachers will coordinate public health officials presentations and cover information concerning public health.

Linkages to industry: Students will tour a local water treatment plant, listen to and interview guest speaker(s), and participate in training for water sampling certification (½ day through AWA).

Timeline: The project will take approximately two weeks, within microorganism/Biology unit.

Assessment strategies: Students will keep a learning log/journal. Students will be assessed on their ability to collect samples calculate, graph, interpret, and present research. Students will also provide peer reviews of research presented.

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